

國家科學及技術委員會補助專題研究計畫報告

台灣青少年交友網絡與縱貫性健康影響：探索表現性別規範的角色(L03)

報告類別：成果報告
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執行單位：國立成功大學醫學系小兒科

計畫主持人：蔡孟哲
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本研究具有政策應用參考價值：否 是，建議提供機關
(勾選「是」者，請列舉建議可提供施政參考之業務主管機關)
本研究具影響公共利益之重大發現：否 是

中華民國 112 年 03 月 22 日

中文摘要：背景

青少年時期是發育的關鍵時期，此時青少年通常對同伴的影響和社會規範相當敏感。性別認同可以被概念化為一整群的行為表達，也被稱為表現性別，會不斷受到社會規則的塑造，像是關於男孩(人)與女孩(人)的可被接受行為界線，包括了他們應該如何行為、思考、甚至感受。然而，表現性別規範與友誼網絡的動態特徵之間的相互影響仍然較少研究，特別是在東亞社會環境中也缺乏關於表現性別對青少年心理和行為健康結果長期影響的文獻。

目的

我們的目標是(1)表徵台灣青年的表現性別規範，(2)檢視表現性別對心理和行為健康結果長期影響，與(3)探索表現性別與友誼網絡的動態特徵之間的相互影響。

方法

資料來自台灣青少年成長歷程計畫(TYP)，根據探索性回歸的方法把TYP中的相關項目整合後，創建一個有效的表現性別測量方式，也就是將性別表達模型建在性別典型行為與態度的量表(GTBAS)，其中J1世代(7年級，平均13歲)的數據用來生成模型並進一步在J3世代(9年級，平均15歲)的測試可靠性。遠期結果是心理健康和與健康相關的行為，因此我們先利用群組軌跡分析找出性別表現的過程，接著創建多個廣義估計方程模型，以檢視表現性別規範對遠端結果的縱貫性影響。接著社會網絡分析的創建基於時間連續性馬可夫鏈蒙地卡羅演算法的有條件和無條件的隨機參與者導向的模型。為探索表現性別規範與友誼網絡的動態特徵之間的相互影響友誼動態次模型測試個人GTBAS的分組對於建立新的相互友誼聯繫的效果，另一個性別動態次模型測試動態網絡特性對後續波次中GTBAS分組變化的影響效果。效果大小可以解釋為有條件的勝算比，它反映了個人在兩個可能結果之間做出改變的似然度。

結果

建構的GTBAS中的大多數項目與理論和實證結果一致，變化多少反映了社會文化差異。分半測驗顯示出良好的項目信度。而所有波次的GTBAS分數之間存在高度相關性，但性別分層後相關性降低。較高的GTBAS百分位分數與捲入嚴重的打架和與男性朋友成為朋友有關。根據於五波數據，我們確定了四種不同的性別表現軌跡。此外，我們發現軌跡與社會心理健康結果無關。而建立在性別表現的社交網絡也不影響網絡特徵。

結論

裁量現有的縱貫性和代表性數據，我們將針對台灣背景下性別典型行為與態度創建有效且可靠的測量方式，能更好地攫取表現性別對心理與行為健康結果的縱貫性影響中性別內部和之間的差異。性別表現與長期社會心理健康結果與朋友網絡並無關係可能反應台灣青年性別發展的現實狀況。因此這些發現將有助於發展與設計性別合適的青少年計畫，幫助他們渡過此人生的重要階段，特別是性別認同不一致的社群。

中文關鍵詞：青少年發展、表現性別、心理健康、行為結果、社會網絡分析

英文摘要：Background

Adolescence is a critical period of development, where adolescents are typically sensitive to peer influence and social norms. Gender identity can be conceptualized as a constellation of behavioral expressions. That is being said, a performing gender constantly shaped by social rules about the acceptable boundary of behaviors for boys/men and girls/women, regarding how they are supposed to act, think, and even feel. However, the reciprocal effects between performing gender norms and dynamic features of friendship networks remain less researched. There is scarce literature on the long-term impacts of performing gender on adolescent psychological and behavioral health outcomes, particularly in an East Asian social setting.

Purposes

We aim to (1) characterize the norms of performing gender among Taiwanese youth, (2) examine the long-term impacts of performing gender on psychological and behavioral health outcomes, and (3) explore the reciprocal effects between performing gender norms and dynamic features of the friendship network.

Methods

Data come from the Taiwan Youth Project (TYP). A valid measurement of performing gender, namely gender expression modeled on a gender-typed behavior and attitude scale (GTBAS), was created using an experimental regression-based method integrating relevant items in TYP. Data on J1 cohort (7th graders, average age 13 years) were used for generating the model that can be further tested for reliability on J3 cohort (9th graders, average age 15 years). Distal outcomes are psychological well-being and health-related behaviors. Group-based trajectory analysis was initially conducted to identify different paths of gender performance. Multiple generalized estimating equation models were thus created to examine the longitudinal impacts of performing gender norms on distal outcomes. Further, social network analysis was built upon conditional and unconditional stochastic actor-oriented models that were based on a continuous-time Markov chain Monte Carlo algorithm. In order to explore reciprocal effects between performing gender norms and dynamic features of friendship networks, a dynamic friendship submodel tested the effect of individuals' grouping by GTBAS on the propensity to establish a new reciprocal

friendship tie. Another gender dynamic submodel tested the effects of dynamic network features on changes in grouping by GTBAS at later waves. Effect sizes can be interpreted as conditional odds ratios and reflect on the likelihood of an individual who is making a change between two possible outcomes.

Results

Most items in the constructed GTBAS were consistent with theory and empirical findings, with some variations that reflected sociocultural differences. The split-half test showed good item reliability. There was a high correlation between GTBAS scores across all waves, but the correlation decreased after gender stratification. A higher percentile GTBAS score was associated with being involved in a serious fight and befriending a male friend. Based on the five waves of data, we identified four different trajectories of gender performance. Moreover, we found that the trajectory was unrelated to psychosocial health outcomes. The social network built upon gender performance did not affect the network features.

英文關鍵詞：Adolescent development, performing gender, psychological health, behavioral outcomes, social network analysis

國家科學及技術委員會專題研究計畫報告撰寫格式

一、說明

國家科學及技術委員會基於學術公開之立場，鼓勵一般專題研究計畫主持人發表其研究成果，但主持人對於研究成果之內容應負完全責任。計畫內容及研究成果如涉及專利或其他智慧財產權、違異現行醫藥衛生規範、影響公序良俗或政治社會安定等顧慮者，應事先通知國家科學及技術委員會不宜將所繳交之成果報告蒐錄於學門成果報告彙編或公開查詢，以免造成無謂之困擾。另外，各學門在製作成果報告彙編時，將直接使用主持人提供的成果報告，因此主持人在繳交報告之前，應對內容詳細校對，以確定其正確性。

報告繳交之期限及種類（進度報告及成果報告），應依本會補助專題研究計畫作業要點及專題研究計畫經費核定清單之規定辦理。成果報告分為完整報告及精簡報告，選擇延後公開完整報告者，應繳交可立即公開之精簡報告，涉及專利申請、技術移轉、其他智慧財產權或論文尚未發表等，而不宜對外公開部分應不予列入。延後公開期限期滿後，完整報告將自動公開並覆蓋精簡報告。至報告內容之篇幅，進度報告以 4 至 10 頁為原則，並應忠實呈現截至繳交時之研究成果，完整報告不得少於 10 頁，精簡報告以 3 至 10 頁為原則。

二、報告格式：依序為封面、目錄、中英文摘要及關鍵詞、報告內容、參考文獻、可供推廣之研發成果資料表、附錄。

- (一)報告封面：請至本會網站 (<https://www.nstc.gov.tw>) 線上製作 (格式如附件一)。
- (二)中、英文摘要及關鍵詞 (keywords)。
- (三)報告內容：包括前言、研究目的、文獻探討、研究方法、結果與討論 (含結論與建議、執行計畫過程遇到之困難或阻礙) 等。
- (四)頁碼編寫：請對摘要及目錄部分用羅馬字 I、II、III.....標在每頁下方中央；報告內容至附錄部分請以阿拉伯數字 1.2.3.....順序標在每頁下方中央。
- (五)附表及附圖可列在文中或參考文獻之後，各表、圖請說明內容。
- (六)可供推廣之研發成果資料表：
 - 1.研究計畫所產生之研發成果，應至國家科學及技術委員會科技研發成果資訊系統 (STRIKE) (自國家科學及技術委員會學術研發服務網登入後連結 STRIKE 系統) 填列研發成果資料表 (如附件二)，循執行機構行政程序，由研發成果推廣單位 (如技轉中心) 線上繳交送出。
 - 2.每項研發成果填寫一份。
- (七)成果彙整表 (如附件三)：請至本會網站線上填寫。
- (八)若該計畫已有論文發表者 (須於論文致謝部分註明補助計畫編號)，得作為成果報告內

容或附錄，並請註明發表刊物名稱、卷期及出版日期。若有與執行本計畫相關之著作、專利、技術報告、或學生畢業論文等，請在參考文獻內註明之。

(九)該計畫若列屬國際合作研究，應將雙方互訪及合作研究情況、共同研究成果及是否持續雙方合作等，於報告中重點式敘明。

三、計畫中獲補助國外差旅費，出國進行國際合作與移地研究、出席國際學術會議或出國參訪及考察者，每次均須依規定分別撰寫出國心得報告（其中，出席國際學術會議者須另附論文被接受發表之大會證明文件及發表之論文全文或摘要，但如為該領域之重要國際學術會議，已敘明理由報經本會同意或受邀專題演講或擔任會議主持人者不在此限），並至本會網站線上繳交電子檔，出國心得報告格式如附件四、五、六。

四、計畫中獲補助國外學者來臺費用，每次均須分別撰寫國外學者來臺訪問成果報告，並至本會網站線上繳交電子檔，報告格式如附件七。

五、研究計畫涉及臨床試驗且進行性別分析者，成果報告應一併繳交性別分析報告，說明性別分析之結果，報告格式如附件八。

六、報告編排注意事項

(一)版面設定：A4 紙，即長 29.7 公分，寬 21 公分。

(二)格式：中文打字規格為每行繕打（行間不另留間距），英文打字規格為 Single Space。

(三)字體：以中英文撰寫均可。英文使用 Times New Roman Font，中文使用標楷體，字體大小以 12 號為主。

七、成果報告除敏感科技研究計畫外，應供立即公開查詢。如需延後公開，應註明原因及延後時間。

國家科學及技術委員會補助專題研究計畫報告

(計畫名稱)

報告類別：進度報告

成果報告：完整報告/精簡報告

計畫類別：個別型計畫 整合型計畫

計畫編號：NSTC 110-2629-B-006-001-

執行期間：2021年8月1日至2022年12月31日

執行機構及系所：國立成功大學醫學系

計畫主持人：蔡孟哲

共同主持人：李芷婷、莊佳蓉

計畫參與人員：林俞坊、甘傑生

本計畫除繳交成果報告外，另含下列出國報告，共 1 份：

執行國際合作與移地研究心得報告

出席國際學術會議心得報告

出國參訪及考察心得報告

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(勾選「是」者，請列舉建議可提供施政參考之業務主管機關)

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中華民國 112 年 3 月 21 日

背景

青少年時期是發育的關鍵時期，此時青少年通常對同伴的影響和社會規範相當敏感。性別認同可以被概念化為一整群的行為表達，也被稱為表現性別，會不斷受到社會規則的塑造，像是關於男孩(人)與女孩(人)的可被接受行為界線，包括了他們應該如何行為、思考、甚至感受。然而，表現性別規範與友誼網絡的動態特徵之間的相互影響仍然較少研究，特別是在東亞社會環境中也缺乏關於表現性別對青少年心理和行為健康結果長期影響的文獻。

目的

我們的目標是(1)表徵台灣青年的表現性別規範，(2)檢視表現性別對心理和行為健康結果長期影響，與(3)探索表現性別與友誼網絡的動態特徵之間的相互影響。

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建構的 GTBAS 中的大多數項目與理論和實證結果一致，變化多少反映了社會文化差異。分半測驗顯示出良好的項目信度。而所有波次的 GTBAS 分數之間存在

高度相關性，但性別分層後相關性降低。較高的 GTBAS 百分位分數與捲入嚴重的打架和與男性朋友成為朋友有關。根據於五波數據，我們確定了四種不同的性別表現軌跡。此外，我們發現軌跡與社會心理健康結果無關。而建立在性別表現的社交網絡也不影響網絡特徵。

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關鍵詞 青少年發展、表現性別、心理健康、行為結果、社會網絡分析

Background

Adolescence is a critical period of development, where adolescents are typically sensitive to peer influence and social norms. Gender identity can be conceptualized as a constellation of behavioral expressions. That is being said, a performing gender constantly shaped by social rules about the acceptable boundary of behaviors for boys/men and girls/women, regarding how they are supposed to act, think, and even feel. However, the reciprocal effects between performing gender norms and dynamic features of friendship networks remain less researched. There is scarce literature on the long-term impacts of performing gender on adolescent psychological and behavioral health outcomes, particularly in an East Asian social setting.

Purposes

We aim to (1) characterize the norms of performing gender among Taiwanese youth, (2) examine the long-term impacts of performing gender on psychological and behavioral health outcomes, and (3) explore the reciprocal effects between performing gender norms and dynamic features of the friendship network.

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Data come from the Taiwan Youth Project (TYP). A valid measurement of performing gender, namely gender expression modeled on a gender-typed behavior and attitude scale (GTBAS), was created using an experimental regression-based method integrating relevant items in TYP. Data on J1 cohort (7th graders, average age 13 years) were used for generating the model that can be further tested for reliability on J3 cohort (9th graders, average age 15 years). Distal outcomes are psychological well-being and health-related behaviors. Group-based trajectory analysis was initially conducted to identify different paths of gender performance. Multiple generalized estimating equation models were thus created to examine the longitudinal impacts of performing gender norms on distal outcomes. Further, social network analysis was built upon conditional and unconditional stochastic actor-oriented models that were based on a continuous-time Markov chain Monte Carlo algorithm. In order to explore reciprocal effects between performing gender norms and dynamic features of friendship networks, a dynamic friendship submodel tested the effect of individuals' grouping by GTBAS on the propensity to establish a new reciprocal friendship tie. Another gender dynamic submodel tested the effects of dynamic network features on changes in grouping by GTBAS at later waves. Effect sizes can be interpreted as conditional odds ratios and reflect on the likelihood of an individual who is making a change between two possible outcomes.

Results

Most items in the constructed GTBAS were consistent with theory and empirical findings, with some variations that reflected sociocultural differences. The split-half test showed good item reliability. There was a high correlation between GTBAS scores across all waves, but the correlation decreased after gender stratification. A higher percentile GTBAS score was associated with being involved in a serious fight and befriending a male friend. Based on the five waves of data, we identified four different trajectories of gender performance. Moreover, we found that the trajectory was unrelated to psychosocial health outcomes. The social network built upon gender performance did not affect the network features.

Conclusion

Tailoring the existing longitudinal and representative data in the Taiwanese context, we

created a valid and reliable measure of gender-typed attitudes and behaviors to capture better within- and between-gender differences in the longitudinal impacts of performing gender on psychological and behavioral health outcomes. A negative finding on the relationship between gender performance and longitudinal psychosocial health outcomes and friendship networks may reflect the status quo of Taiwanese youth gender development. These findings may help develop and design gender-appropriate programs for adolescents as they navigate this critical stage of life, particularly among gender identity nonconforming communities.

Key words Adolescent development, performing gender, psychological health, behavioral outcomes, social network analysis

Introduction

Gender equality is now being one of the UN's sustainable development goals to achieve by a global commitment along with another goal to ensure healthy lives and promote well-being for all.^{1,2} Despite a growing need of incorporating gender into health sciences research, quantifying the gender inequalities on health outcomes is sometimes challenging, if teasing out the effect of biological sex (i.e. genetic, anatomic, and hormonal factors) is required.^{3,4} Notably, existing survey-based data may provide some critical insights into mechanistic pathways from gender norms to health inequalities, albeit remaining methodologically underdeveloped to precisely characterize social norms for boys and girls.⁵ Beforehand, it is imperative to have a measurement technique that can tailor socio-behavioral data embodied in the developmental and sociocultural context.

Gender norms of behaviors

Gender is conceived to encompass both psychological and social components of the human experience, while gender identity is conventionally defined by the extent to which individuals adhere to culturally proscribed attributes of social personality traits and behaviors.⁶ During childhood and adolescence, gender identity develops in sequential steps through an intertwined process of personal reflection and contextual influence. Herein, children and adolescents may actively involve with defining or challenging the social constructions of masculinity and femininity through continuous interactions with their social and cultural contexts. Substantial evidence has found a significant association between the conformity of gender identity and psychological wellbeing in adolescents and young adults.⁷ Gender nonconforming children and adolescents are likely to have mal-adjustment issues and they are at risk for emotional disturbance such as anxiety, depression, and even suicidality.^{8,9} In order to provide comprehensive, culturally competent care to gender nonconforming youth, who may seek care to understand their internal gender identities, socially transition to their affirmed genders, and/or physically transition to their affirmed genders, appropriate training needs have been highlighted in a fast-evolving field of pediatric gender identity that emphasizes a multidisciplinary approach with collaboration of medical, mental health, and social services/advocacy providers.¹⁰ Smiler and Epstein summarized a decent number of techniques measuring different gender-related constructs and raised some critiques.¹¹ Tate and colleagues proposed to conceptualize gender identity as a constellation of behavioral expressions, that is being said a performing gender or gender performativity.^{12,13} Following this sense, gender norms can be conceptualized as societies' rules about the acceptable boundary of behaviors for boys/men and girls/women, in regard to how they are supposed to act, think, and even feel.¹⁴ There is supporting evidence that adolescents who are nonconforming to their gender norms are often socially isolated or even bullied.^{15,16} Sometimes, it is more difficult for boys to challenge gender norms for that they may be penalized for expression of femininity, placing feminine boys at heightened risk for depressive symptoms in adolescence that persist into adulthood.¹⁷ Moreover, increases in gender specific behavioral expressions over time were positively associated with substance use in men but this association was negative in women.¹⁸ Another study demonstrated a salient link between masculinity and risk-taking behaviors.¹⁹ Beyond some effects exerted on contemporaneous behaviors, others might manifest later in life, such as one more recent survey showing that adolescent gender expression was correlated with health outcomes in adulthood, independent of their sexual orientation or the gender to which they feel romantically and sexually attracted.²⁰

Gender and friendship network

Adolescence is a critical time of particular sensitivity to norms and peer influences, in regard to one's psychological and behavioral development.²¹ During this life stage, friendship circles, or networks in a broader sense, have been suggested to be an important outlet for emotional support and stress buffer.²² Further, friendship has implications for shaping adolescents' health-related behaviors, as they tend to rely on their peers for reflecting on their self-image and sense of belonging in a shared school context.^{23,24} Therefore, social network are conceptualized as a dynamic and multifaceted system that can regulate and be regulated by individuals' daily routines.²⁵ That said, Adoption or engagement of health behaviors is constantly determined by the social networks within which adolescents are embedded and the ties connecting them to others through social relationships may further facilitate diffusion of behavior and information.²⁶ Based on this notion, social network analysis provides a theoretical framework that investigations on the features of individual's friendship networks can depend on, considering both attributes of individuals and their friends within the network. Stochastic actor-oriented models (SAOMs) that fit well into longitudinal data have been widely used to analyze determinants and influences of friendship selection.^{27,28} Estimation is based on a continuous-time Markov chain Monte Carlo algorithm and tested by t-ratios with an approximated and standard normal distribution.²⁹ At any given moment, SAOMs choose one study participant (also called ego) to determine the probability of tie (i.e. a connection between two study participants) and behavioral changes depending on this ego's current network position and behavioral status.³⁰ This recently developed model pattern is able to estimate change in behavior and change in friendship bonds via modeling these factors endogenously, so as to untangle issues related to homophily (i.e. students choosing similar friends) and contagion (i.e. students transmitting similar behaviors).³¹ Alongside these, there is also a crucial need to identify the importance of social popularity/isolation and its impacts cross health behaviors or attitudes.²⁶ This method has been applied in multiple areas of social science research and now gains popularity in adolescent health-related issues (e.g. depression, substance use, and obesity).³²⁻³⁴ Gender used to be treated as a stratification factor and thereby implied in relevance to outcomes in the multilevel social network analysis. For example, male friend closeness may increase drinking behaviors in both boys and girls, but no effect found in closeness to females.³⁵ An US study also found that distressed youth were more likely to be socially excluded and friends influenced one another's mood levels.³⁶ However, these processes may differ for boys and girls, as distressed girls were more likely to face exclusion and distressed boys were more likely to befriend and subsequently influence one another. Gender in these discussions is rarely regarded as the main driver of friendship formation. Two previous studies from Finland and Sweden also found that gender did not affect social network formation among adolescents,^{32,37} but contradictory findings existed among university students in regard of gender homophilic effects.³⁸ It remains open for debates concerning how to interpret the observed deviation between men and women, as well as to untangle the effects originating from different biological predispositions and social expectations, which are likely to lead the two genders to develop and maintain their social ties in different ways.³⁹

Gaps in current knowledge

As adolescents become increasingly mature in sexual development, they are expected to fit into social group identities and to adopt the normative behaviors of peers, including those socially constructed and often stereotypical gender norms.⁴⁰ There is some supporting evidence of the central roles of peers in shaping adolescents' gender attitudes.¹⁵ For instance, male peers may encourage their gangs to conform to masculine norms using either physical or verbal challenges.^{41,42} Sometimes, they are challenged to engage in risk-taking practices, such as drag racing, substance use or even unsafe sexual

behaviors.^{43,44} Boys who fail to achieve local masculine standards can be the target of bullying or ridiculing by their peers.¹⁵ Likewise, girls are expected to adhere to social norms that reflect the feminine standards and gender boundaries, or otherwise they may get shamed or sexually harassed if violating the norms.^{45,46} Furthermore, the perception of what peers endorse and do may in turn, influence personal attitudes and behaviors.¹⁵ However, current knowledge is derived mainly from cross-sectional studies conducted in Western Europe or North America, leaving a large gap in the global perspective or the one with a more Asian focus. There is also an urgent need to collect longitudinal data to better understand the evolving nature of gender attitudes and behaviors across adolescence and its impacts on health trajectories over time. Nowadays, SAOMs as described earlier are probably of higher quality and able to identify the socialization process, as the entrance into the puberty brings expectations in regards of gender attitudes and behaviors. To the best of our knowledge, social network analysis has not been applied to study the development of adolescent gender norms. This study was one of the pioneers in profiling the characteristics of gender norms of attitudes and behaviors in Taiwan, a less researched East Asian social context.

Aims of study

Situating our project against the current backgrounds, we aim to examine the relationship between performing gender norms (i.e., the gender norms of attitudes and behaviors) and friendship networks among Taiwanese youth. Specifically, we used a subset of longitudinal data to:

1. Characterize the norms of performing gender among Taiwanese youth
2. Examine the impacts of performing gender on psychological and behavioral health outcomes
3. Explore the reciprocal effects between performing gender norms and dynamic features of friendship network

Materials and methods

Subjects

Data come from the Taiwan Youth Project (TYP) conducted by the Institute of Sociology, Academic Sinica, Taiwan. The TYP is an ongoing longitudinal panel study that began in 2000 and followed the same cohort annually up to now. Based on development indices, this project chose three administrative areas and used a school-based, stratified sampling strategy to survey a total of 40 schools that were located in Taipei City (16 schools), Taipei County (15 schools), and Yilan County (9 schools). Further, two or three classes in 7th (J1, average age 13 years) and 9th (J3, average age 15 years) grades were chosen from every school, and all students were invited to participate in this self-administered questionnaire-based survey. The Institutional Review Board of the National Cheng Kung University Hospital has approved this study.

Gender-typed behaviors and attitudes

The primary exposure variable is a measure of an individual's gender expression.⁴⁷ Per this purpose, a gender-typed behavior and attitude scale (GTBAS) was created to identify the variables that best discriminate between males and females and use the estimated effects in a logistic regression model. This technique has been proposed by Fleming and colleagues, and the resulting construct was able to capture the performance of gender rather than self-reported ideologies or attitudes towards gender-specific social expectations.¹³ Specifically, items related to behaviors, wherein broadly defined by actions performed by the individuals (e.g., smoking) and states of being (e.g., feeling upset), were explored from the large pool of survey questions.¹³ Given no consensus on defining the norms of adolescent gender-typed behaviors and

attitudes, particularly in an East-Asian setting, we conducted an exploratory search for relevant measures at waves 1, 2, and 3 among individuals in J1 cohort, because they had been annually followed throughout the junior high school in the TYP dataset, based on the literature and gender framework proposed previously.¹³ We invited a panel of experts in the fields of developmental and educational psychology, adolescent medicine, and public health to review and determine the final set of preliminary variables to test. In order to identify the discriminating variables between genders, we then compared means for continuous and frequencies for categorical variables between males and females using Student t and chi-square tests, respectively. Further, those *p*-values derived from between-gender comparisons were ranked according to their statistical significance. The top 50% of the ranked variables were entered in a logistic regression model, where self-reported binary gender (*y*) is the dichotomous outcome variable to be modeled on a constellation of behavioral expressions (*x*).

$$\text{logit}(y) = \alpha + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 \dots + \beta_ix_i$$

A stepwise selection procedure with *p*-value < 0.1 for entry and *p*-value < 0.05 for stay was applied to determine the stay of variables in the final model. As such, we can create a model-based predicted probability score of performing gender norms for each individual. Using this criterion for each wave, we intersected the common variables selected from each wave and then build on the same model to yield predicted probabilities for each individual. Data on J1 cohort were used for generating the model that can be further tested for reliability on J3 cohort. As the end, a score on this scale represented a predicted probability of behaving in ways that are similar to the behaviors of a typical male or female for each individual. For the analytic purpose as indicated in some analyses, GTBAS may be transformed into an ordinal variable representing different masculine/feminine groups according to some cut-off values that are to be determined by the distribution of original scores.

Gender contentedness

Egan and Perry proposed a multidimensional model of gender identity measured by an instrument that includes individuals' perceptions of how typical they are for their gender (gender typicality), how content they are with their socially proscribed gender role (gender contentedness), and how pressured they feel to conform to gender norms (felt pressure from peers and parents).⁴⁸ As argued, gender-atypical behavior and dissatisfaction with one's gender assignment may co-occur, which may suggest that self-perceived gender atypicality and gender discontentment are two correlated indexes of a common and more global underlying factors of felt gender compatibility.⁴⁸ Therefore, we examined the content validity of GTBAS by correlating it with an external measurement of gender contentedness. In the dataset, gender contentedness was assessed at wave 1 by asking participants to indicate the level of satisfaction for their own gender on a 4-point Likert scale from 1 (very satisfied) to 4 (very unsatisfied). Pearson's *r* was calculated with gender stratification between cross-sectional GTBAS and gender contentedness at wave 1.

Friendship nominations

From waves 1 to 3, participants listed the names of their best friends in their grade at school. At wave 1, 5 spaces were provided, whereas only three were allowed at waves 2 and 3, and there was no limit on the gender or number of nominations. For consistency reasons, we only kept the first three best friend nominees at wave 1 so that at least the best three friends nominated at each wave were entered to build the friendship network. A direct adjacency matrix was used to represent the friendship network, where cells coded as 1 denote a unidirectional friendship tie between

participants i and j , and 0 the absence of friendship. Given that the school appears to be the most crucial interaction venue for developing adolescents, we restricted the nominees within the school setting and also identifiable in TYP dataset for the reason of model integrity. Moreover, for the purpose of building the social network, only cohort J1 was included because they provided information on their friendship nomination for three consecutive years over the entire period of junior high school, leaving J3 out of the network analysis. Based on the built network, descriptive statistics were employed to summarize the main indicators of an informant's network compositions (also called alter characteristics), i.e. the average nomination (out-degree), the number of participants that were nominated (in-degree), the proportion of mutual friendship mutually (reciprocity), and the tendency to select a friend who was friends' friend (transitive triplets) within the networks. Using these indicators, we may consequently characterize popularity and social segregation or isolation.

Outcome variables

Alcohol and tobacco use

Alcohol drinking and cigarette smoking were assessed by asking participants to indicate whether they had drunk alcohol within one month and whether they had smoked cigarettes within one week. The answers were categorized into three groups: "none", "less than one time per week", and "more than one time per week" for alcohol drinking; and "none", "less than one pack per week", and "more than one pack per week" for cigarette smoking. For the analytic purpose, the answers may be recoded into a binary variable with "no" or "yes" to reflect the experience of tobacco or alcohol uses. In addition to the distal outcomes of substance use assessed at wave 9, we also explored the dataset to define early tobacco and alcohol users at age less than the age of 18 years, which is the legal age for tobacco and alcohol use in Taiwan, in the analysis.

Premarital sex

Participants were asked about their sexual experience at wave 9 by the following question: "Have you had sex before?" Responses were dichotomized "Yes" and "No". Given that the legal age of consent for sex is above age 18 years, we intend to define early sexual behavior at age less than 18 years and current premarital sexual behavior in the analysis.

Psychological symptoms

At all waves, adolescents were asked whether they had experienced the following situations: (1) headache, (2) dizziness, (3) loneliness, (4) low mood, (5) worries, (6) wanting to hurt others, (7) arguing with others, (8) screaming or breaking things, (9) insomnia, (10) early wake-up and difficulty in falling back to sleep, (11) light sleep, (12) muscle pain, (13) feeling numb, (14) feeling stuck-throat, (15) feeling weak, and (16) having suicidal feelings. Participants answered each question on a scale of 0 (never) to 4 (very often). These symptoms that typically represent psychological problems have been applied in mental health-related investigations of adolescents in Taiwan.^{49,50} The scale was averaged of the fifteen items and then rescaled from 0 to 4. The higher the score, the more psychologically troubled the respondent may be considered.

Delinquent behaviors

Adolescents were asked at all waves to report their possible delinquent behaviors in the past one year, including "running away from home or skip class", "fighting or bullying others", "drug use", "cheating and defrauding" and "stealing". All these behaviors

were self-reported originally on a scale from 0 (never) to 4 (always). In this study we intend to recode their answers into a dichotomous response using “yes” or “no”. Moreover, the delinquent behaviors are to be summed up to indicate accumulative delinquent behaviors. We calculated the mean of the five items and then rescale scores from 0 to 4.^{51,52}

Covariates

Age and sociodemographic parameters, such as household incomes, parental education levels, and living area, were adjusted wherever appropriate in the analysis.

Analytic strategy

Longitudinal impacts of performing gender norms on developmental and health outcomes

We first modeled the trajectory as we are interested in measuring the course of GTBAS over time. We used Group-Based Trajectory Model (GBTM) to categorize the different trends of GTBAS over five time points using STATA ver.15 (StataCorp. 2017. *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LLC). Missing predicted probabilities of more than two in GTBAS were excluded from the GBTM to ensure that the trajectory analysis was based on a minimum of three data points. Variables with complete cases with non-missing data in all waves were entered into the GBTM analysis to determine the optimal number of class memberships and the shape of growth curves. Next, we assessed the shape of trajectory groups by determining the higher-order polynomial growth factors (intercept, linear, and quadratic time factors). The Bayesian Information Criterion (BIC) was used to identify the optimal number of trajectory groups. Also, the average posterior probability measure and odds of correct classification were used to measure the best-fit trajectory shape. Once the shape and the number of the best solution were determined where the GTBAS over time were entered into the GBTM, and each was assigned to one of the latent classes using the modal class assignment procedure and the posterior distribution information pertaining to GBTM. Given that some variables (e.g., psychological symptoms and delinquent behaviors) were repeatedly measured over time, we examined the longitudinal effects of performing gender on psychological and behavioral outcomes using generalized estimating equation (GEE) analysis. GEE modeling, initially proposed by Liang and Zeger⁵³, has been popularly applied in longitudinal research because it provides consistent estimates when the marginal model is correctly specified, even if the working correlation matrix is imperfectly assumed.⁵⁴ The models can either be logistic or linear regression analysis according to the features of outcome variables. In logistic models, odds ratios (ORs) and 95% confidence intervals (95% CI) were computed, while β (95%CI) in linear models. We explored within- and between-gender differences by stratifying by gender and testing an interaction term between GTBAS and gender, respectively, in the GEE analysis. Homogeneity tests may also be used to examine the mutual moderating effects of gender and performing gender. As such, we may obtain the likelihood of having health outcomes in individuals who behave similarly to their same-gender peers vs. those who behave dissimilarly (within-gender difference) and the likelihood of having health outcomes in individuals who behave less similarly to their same-gender peers vs. their opposite-gender peers (between-gender difference).

Reciprocal effects between performing gender norms and dynamic features of friendship network

To accomplish the study on the dynamic evolution of friendship networks and their interaction with performing gender norms, we built unconditional and conditional SAOMs using the Simulation Investigation for Empirical Network Analysis (SIENA)

program in R.³⁰ This method can allow for interdependencies between dynamic changes in social networks and the personal attributes of the individuals within them. For instance, a positive coefficient linked to altering characteristics usually indicates a positive effect on the network composition, a linear combination of specified effects as in generalized linear models. Furthermore, two dynamic models were built to test the reciprocal effects of interest. Specifically, the first one modeled the effects of performing gender norms on changes in friendship ties. That being said, the model tested whether the ordinal groups based on GTBAS, representing the extent of conforming to masculine/feminine norms, determine the propensity to nominate a new friend or receive a new friend nomination, along with its effects on popularity, reciprocity, and transitivity. In addition, we examined whether individuals with a similar grouping on GTBAS are more likely to establish a new reciprocal friendship tie. The second one modeled the effects of dynamic network features on changes in grouping on GTBAS at later waves. Effect sizes of coefficients can be interpreted as conditional odds ratios and reflect the likelihood of an individual who is making a change between two possible outcomes. Given our sample comprising 80 classes that were the fundamental sampling units, we built 80 separate network models adjusting for gender and covariates, and subsequently combine the results using meta-analysis²⁹ that computed between-class differences with an approximate chi-square test of parameter variances.⁵⁵ We further calculated the number of friendship ties that were being maintained, dissolved, and emerged over the observation waves, so as to compute Jaccard index, which was the indicator of the network stability between waves.^{30,56}

Results

The overall sample included a total of 1,398 students (706 males and 692 females) with a mean age = 13.3 (± 0.18) years at wave 1 (**Table 1**). Male students most commonly lived in Taipei City (37.5%), while females were in Taipei County (36.8%). For males, the mean probability score ranges from 0.66 to 0.72 and around 0.28 to 0.35 in women. Generally, a higher percentage of male students (ranging from 12.9% to 26.5%) were involved in serious fights in the past week compared to their female counterparts (ranging from 7.7% to 11.4%). Though, the frequency of involvement in fights decreased over time in both genders. Scrutinizing the missing values across waves, we found a decent percentage of missing at waves 2 and 3. Despite so, the data were missing at random, given an observed level of significance (**Table 2**).

Gender performance scale

Using split-half samples, we examined the measurement reliability and found 3 to 5 different items between the subsamples, indicating a small variance between the models. Thus, the item discrimination and mean differences showed little variance across waves and between genders, making the included final items reliable. In another reliability test (**Table 3**), where we measured the correlation coefficients between each wave's gender percentile scores overall and by gender, the results showed averagely high Pearson correlation coefficients across all waves (r ranging from 0.43 to 0.53) in the overall sample. However, when stratifying the analysis by gender, we observed a decrease in correlation coefficients in males (r ranging from 0.02 – 0.18) and in females (r ranging from 0.14 – 0.24). Plotting the distribution of gender percentile scores at wave 1 against the other waves, we found a consistent, concentrated distribution in the upper right corner in males in contrast to a concentrated distribution in the lower-left corner in females (**Figure 1**). To assess the content validity of the built GTBAS, we consistently found that those who were involved in fighting behavior had a higher gender percentile score than those who were not (**Table 5**). Furthermore, for the convergent validity, the average inter-item correlation was around 0.885, indicating

a relatively high internal consistency. Further, in the exploratory analysis where we examined the relationship between gender performance and gendered friendships, the results showed that having a male best friend was associated with a more masculine gender performance both in males and females (**Table 6**).

Gender performance and psychosocial outcomes

Based on the five waves of data, the three-class solution was the best fit for GTBAS in GBTM because of having low BIC. Another, the average posterior probability value was around 0.6 to 0.7 to all groups, and consistently high value in odds of correct classification that shows an acceptable probability value in **Table 7**. From the 4 groups, we created the result that shows GTBAS in **Figure 2** which are the following: in Group 1 ($n=103$; 7.8%), it was observed to have persistently low score from 2 waves where they could be considered as nonconforming gender norms but gradually increased in the following time-period; in Group 2 ($n=835$; 54.8%), there was an increasing trajectory from low-to-high gender norms score across time-period; in Group 3 ($n=156$; 10.2%), where the gender norm scores were consistently high across time periods, indicating a persistently conforming gender norm; and in Group 4 ($n=235$; 27.2%) where the gender norm score declined from a high to a low across time.

In **Table 8**, the proportion of non-conforming gender norms (Group 1) was observed to be higher among males ($n=29$; 65.9%), who studied in Taipei County ($n=35$; 38.5%), with low-income status ($n=14$; 29.2%), with a father and mother who are undergraduates ($n=33$ (41.3%) and 38 (46.3%), respectively, and with a normal BMI ($n=59$; 64.1%). There was a fair distribution in both sexes among the persistently moderate gender norm (Group 2), but it was commonly observed to be studied in Taipei City and Taipei County: 309 (41.5%) and 300 (40.3%), who belonged to the upper-high income level ($n=129$ (26.1%), with both parents being undergraduates, and with a normal BMI ($n=432$; 58.2%). In persistently conforming gender norms (Group 3), the majority were females ($n=39$; 52.7%), who studied at Taipei County ($n=72$; 50.4%), with income status ranging from upper-middle to lower-high level, where both parents are undergraduates, and with a normal BMI ($n=87$; 62.6%). In addition, in the group of young adults with declining high-to-low gender norms (Group 4), most of them were males ($n=58$; 53.7%), who studied in Taipei County ($n=105$; 48.2%), who belonged to an upper-high income level ($n=36$; 25.9%), with both parents being undergraduates, and with a normal BMI ($n=125$; 59.2%). Furthermore, it was consistent across all the GTBAS trajectory groups that young adolescents were observed to have low scores for self-reported health, self-reported happiness, depressive symptomology, and deviant behavior.

After adjusting for confounders, the results in **Table 9** show that self-reported health decreased for all the GTBAS trajectories, especially among young adults with a declining high-to-low gender norm, followed by a non-conforming gender norm, and a persistently conforming gender norm, compared to a persistently moderate gender norm. However, the results are not significant. The non-conforming gender norm was reported to have less happiness compared to the persistently moderate gender norm, but the difference was not significant. Furthermore, depressive symptoms were significantly greater among young people who consistently conformed to gender norms. Furthermore, deviant behavior was significantly higher among young adolescents with declining from high to low and non-conforming gender norms compared to a persistently moderate gender norm.

Social network analysis

A network dynamics model was used to examine the effects of weight status and lifestyle variables on friendship selection (**Table 10**). The endogenous network structural effects indicated that there was an overall tendency against arbitrary friendship formation (negative out-degree effect) and towards mutual friendship nominations (positive reciprocity effect). Popularity was not a predictor of forming a friendship tie. Dissecting the effects of the independent variables on friendship formation, we found that the participants' friendship selection was significantly associated with similarities in gender ($\beta = 1.01$ [standard error = ± 0.12], $p < 0.001$). Moreover, male participants tend to send more friendship nominations ($\beta = 0.28$ [± 0.138], $p < 0.05$). However, pubertal development and gender performance were not related to the formation of friendship ties.

The behavior dynamics model mainly tested effects predicting changes in gender performance over time (**Table 11**). Overall, we did not observe any effect of peers' behavioral status on participants' gender performance, indicating that adolescent gender-typed attitude and behavior were not influenced via friendship connections.

Discussion

In this study, we demonstrated an epidemiological manner to assess gender performance norms on a scale created using items in a longitudinal cohort survey. In addition, we addressed the variations in certain gender norm attitudes and behaviors over entire adolescence and related them to health and social consequences. The discussions should be able to provide some insights into gender and adolescent developmental research from the epidemiological perspective.

In building our gender performance norm scale, we used attitudinal and behavioral items that were common in epidemiological surveys on the general adolescent population. However, these items may not be similar to those included in previously developed scales, such as the Gender Equitable Men (GEM) Scale and the Gender Role Conflict/Stress (GRC/S). The GEM scale commonly includes measuring variables related to sexual and reproductive health, sexual relations, violence, domestic work, and homophobia, while the GRC/S could assess certain items like power, competition, subordination to women, restrictive emotionality, and sexual prowess^{57,58}. A study among young men aged 15-24 years in Brazil⁵⁸ found that the correlations between the scale scores and certain behavioral health outcomes, such as violence, reveal consistency with the existing salient gender norms among groups of men (e.g., aggressive fighting and aggression behavior), reported in some literature^{59,60}. Despite the methodological disparity, our study also found more masculine behavior among youths who are more involved in serious fighting behavior. Masculinity was traditionally associated with aggression and coercive behavior, whereas femininity was associated with caring, sensitive, and warm behaviors. This phenomenon was brought about by sexist socialization^{61,62}. Regarding the temporal changes in gender performance, our study discovered a low correlation between the developed gender sensitivity scale at different waves, demonstrating changing masculinity and femininity among Taiwanese adolescents over time. This finding also echoed a previous survey using Bem's Sex-Role Inventory in that women's personality traits as they found showed a constant change over time among the US adolescent population⁶³.

Among attitudinal and behavioral items included in the GTBAS, we observed some items that were consistently representative in other studies, such as "act like smart and witty or behave like have a lot to be proud of", "sharing thoughts and have a close emotion with friends", "playing video games or computer games", and "watching to television, radio, and other media source"⁶⁴. Shared cultural values may explain the commonalities of the included items in the performing gender norm scales. For

example, there were more men than women playing video games as their primary hobby, while women were less likely to see it as an important pastime that usually comes after other leisure-time interests, such as watching television, listening to the radio, and other media source⁶⁵. Moreover, multiple studies have shown significant differences in the manners between men and women^{66,67}. It is well known that women tend to express more of their self-thoughts as compared to men, with recent studies showing those emotions such as happiness, sadness, and fear to be more typically found in women, and anger and pride typically found in men⁶⁸⁻⁷⁰. Despite the consistent pattern of gender difference, there were still varying gender-typed attitudinal and behavioral structures in a cross-country perspective. Some items, such as “frequency of crying”, “frequency of poor appetite”, “upset by difficult problems”, were not cross-culturally selected as the constituting items of performing gender norm scales. The cultural pattern of the different country settings might influence differences in the items between the presently constructed gender norm performance scale. In cross-culture research about the prevalence of crying, the frequency of crying is usually suppressed in both genders in non-Western societies because crying is seen as suffering as well as freedom of expression⁷¹. Another, dietary patterns and food intake were different in each region, such that Asians consume less amount in some food categories compared to Western regions⁷², which shows that each region has a different behavioral and cultural pattern that affects the gender norm towards food intake and diet⁷³. There are a ton of studies that supports the differences in gender dietary pattern and eating behavior where women have a poor appetite and less eating behavior compared to men due to pressure to be thin as they care more about body-image satisfaction, especially among adolescents. Moreover, according to the study by Wardle, he supported the idea that healthy eating behavior, which resulted in selective food preference and less amount of eating, was stereotyped as a feminine practice. At the same time, men who were more concerned about firming their masculinity should not worry much about eating healthy foods at a high amount, even if they know that they should⁷³⁻⁷⁵. Regarding the behavioral difference between the feeling of anger and being upset, there was a clear cultural difference between the different regions. Inlined with our scrutiny, the study support that Asians were relatively conservative in expressing their feelings in front of others, while Western regions expressed these extreme feelings of anger and sadness to anyone as usual and accepted. To explain this, low-arousal and socially engaging emotions were more valued in an Asian setting, and less in Westerners. Furthermore, as a result, the feeling of anger elicits more considerable concessions in regions like Europeans and Americans and more minor concessions among Asians, which also support why there was a cultural difference among regions in the frequency of fighting⁷⁶. With these differences among behavioral and cultural values in each region, some dominant behavioral pattern within a country becomes more apparent, affecting the varying gender expression.

We addressed one of the common issues in establishing test reliability upon using a longitudinal data structure because this type of data composes potentially idiosyncratic participants across measurements prone to error variance. The study of Boateng suggested that a comparator of split-half samples to the total structure with minimal item-variation was needed to give the most credence test of scale reliability⁷⁷, which was fulfilled in our study as there has been a small difference in item means between the constructed split-half and the full-samples. Also, the low correlation between GTBAS at each wave indicates that it captures more individual states than traits. In contrast, if the correlations between the measures at each wave were very high and stable, it might be because traits should not change over time⁷⁸. However, the constructed GTBAS correlation might not be related to the construct itself but rather to

the structure of the correlation. As we used the gender percentile score, where we used the full sample structure to construct it, most of the highest percentile scores were distributed and clustered among men samples while lower percentile scores among women samples. Hereby, the full sample structure would result in higher correlation value. But after stratifying it by gender, as the gender percentile score have different direction of distribution, we would observe a drop in correlation value. This means that the constructed GTBAS was not well-correlated enough as the gender stratification shows no correlation, beside gender is a strong confounding factor in constructing the scale. Also, this means that what we measured using the GTBAS was a gender expression state that changes over time. To prove this phenomenon, some studies show that an individual may behave like men or women in their lifetime, especially during critical periods such as the transition from adolescence to adulthood. They describe that women prioritize financial prospects and social status, whereas men have been revealed to prioritize youthfulness and physical appearance⁷⁹. However, this does not mean that gender attitudinal and behavioral patterns were necessarily universal or fixed. While it was observed that women were more inclined in financial management compared to men, this type of gender behavioral difference decreased over time as the attitude toward managing finance becomes improved by both sexes. The reasons for the decreasing gap in gender norm differences were societal competition and the gradual modernization of gender roles. The pressure of modern society makes the gender role and responsibilities equal for both sexes and eliminates some social stigma toward gender nonconformity^{80,81}. Along with the social structure theory, the gender-role attitudes showed changes following the adulthood and parental stage of life of an individual, which contends that occupying the role of being an adult or being a parent was expected to elicit psychological change, such as an attitudinal change to adapt to this role^{82,83}.

Men and women may have opposite gender norm behavioral patterns concerning involvement in serious fighting⁸⁴. Also, neurobiological responses and psychological approaches to measure gender differences in aggression-related responses exhibit that men have more robust overall aggression indices, including physical and reactive/overt aggression, where fighting behavior is more common than women⁸⁵. There was a difference in gender aggression. However, such changes across time in the pattern of aggression were noticed in modern times, as both males and females experience almost equal aggression⁸⁶. However, evidence is mixed regarding gender differences in aggression over time^{87,88}. Behavioral changes in gender performance might be influenced by low peer trust and cooperation, which were from childhood and early adolescence until middle adulthood, considered more inclined to trust and establish cooperation but slightly decreased towards early adulthood^{89,90}. Awareness of the gender role where both sexes developed new cognitive skills and became more aware of the plurality of approaches to their gender performance may affect by certain factors that cause behavior to change over time (e.g., age, socio-economic status, degree of provocation, etc.)⁸⁶. One of the important of the study findings is that the assessment process to come up with the GTBAS and its validity measurement of the scale explained how gender performance varies in a socio-behavioral pattern throughout the life course stages.

In the exploratory analysis, we found a significant association between gender performance and same-gendered friendships. That is, more masculine individuals tend to have a male best friend. These findings aligned with a prior study showing a reciprocal relationship between interpersonal friendship and individual gender performance⁹¹. Common characteristics developed when having a friend of similar gender, such as that women's same-gender friendships are more expressive, communal,

or face-to-face, while men's same-gender friendships as instrumental, agentic, or side-by-side⁹². Moreover, the way how individuals perceive their friendships may differ by gender. A cross-gender friendship was described by men as closely resembling same-sex friendships, but women reported cross-sex relations as providing less acceptance, less intimacy, and more companionship than same-sex ones. Age could be another salient moderator, as we observed a less significant association between gender performance and gendered friendship in college years. Correspondingly, some studies denoted that college samples might have a higher percentage of cross-gender friends as compared to those in lower years⁹³. Further research may be needed to delineate the underlying mechanism of the reciprocal effect between gender performance and friendship. Further studying the association between gender performance and psychosocial outcomes, we failed to identify any significant relationship. A very similar negative finding was also applied to the impacts of GTBAS on the social network among adolescents. These findings may highlight the independence of psychosocial development and social network from gender norms, although adolescent gender performance changed with time as shown in trajectory analysis.

There are some limitations worthy of attention. First, the GTBAS constructed in this study may be subject to the availability of behavioral and attitudinal questions in the dataset, although it is a large-scale cohort study. Second, the results may not be generalized to some subpopulations, such as minority ethnic groups or school dropouts. Despite so, the scale developed in the present study can still be used as a measurement tool to assess gendered behavioral and attitudinal patterns among adolescents, so that gender and/or developmental researchers can follow individual gender performance and its relationship with youth health and social outcomes. Third, as there was a gap between the data gathering and the secondary analysis, the information provided might not reflect the results of the gender sensitivity analysis. Moreover, as we utilized a longitudinal data survey gathered among the adolescent youth in Taiwan, we could provide a transition of change over time. Furthermore, the dated data collected has provided an alternative strategy for improving existing literature and generating new concepts^{94,95}.

To construe, the assessment strategies centered on the theoretical idea of gender performance have the potential to provide gender researchers with an advantage when examining the role that gender plays in a range of relevant social and behavioral outcomes using empirical survey data. Future researchers may perform methodologically robust studies built on our applied framework and improve knowledge of the changing role of gender in our social environment.

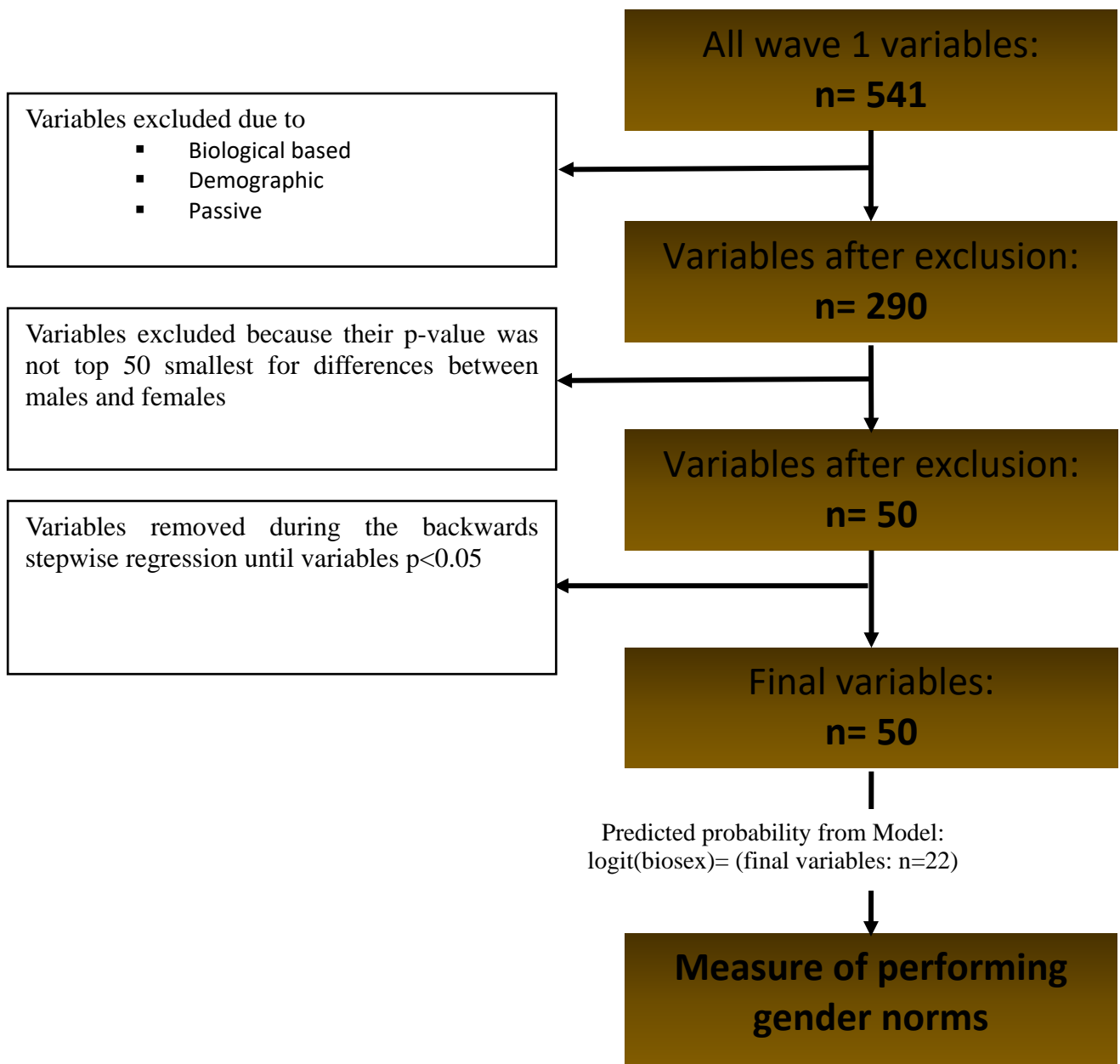


Figure 1. Steps to create measure of performing gender norms for Wave 1

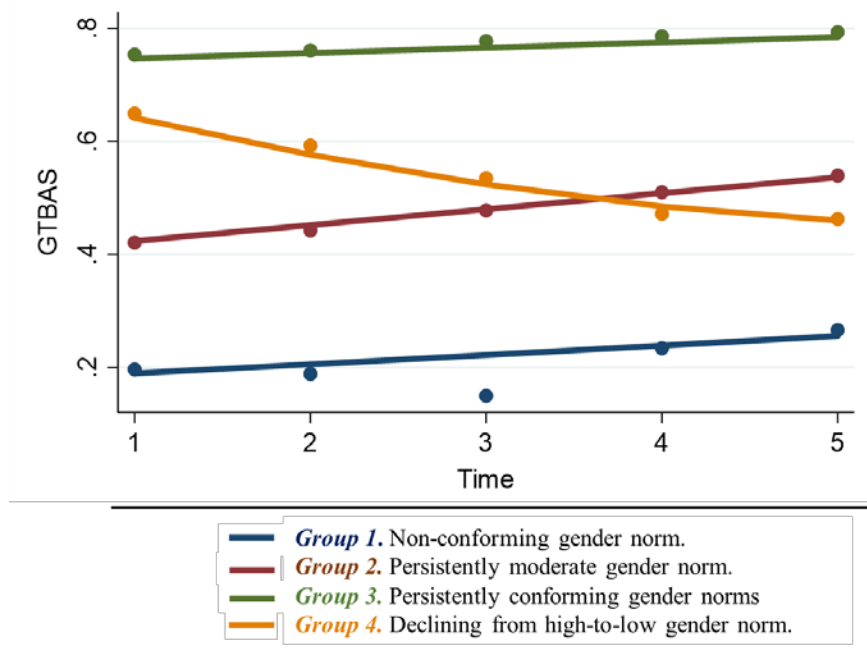


Figure 2. *The group-based trajectories for gender norms over-time.*

Table 1. Characteristics of the Analytic Samples

Characteristics	Male (n=706)	Female (n=692)	Difference Test
School Location (Wave 1)			Pearson Chi-Sq. value (df), p
Rural	24.1%	23.3%	0.128 (1), 0.721
Urban	75.9%	76.7%	
Permanent Residency (Wave 1)			Pearson Chi-Sq. value (df), p
Taipei City	37.5%	34.5%	1.76 (2), 0.415
Taipei County	33.9%	36.8%	
Yilan County and City	28.6%	28.6%	
Age, mean (SD)			t(df), p
Wave 1	13.281 (0.170)	13.281 (0.183)	0.055 (1396), 0.956
Gender probability score, mean (SD)			t(df), p[‡]
Wave 1	0.655 (0.243)	0.346 (0.246)	-23.00 (1328), <0.001
Wave 2	0.721 (0.1777)	0.252 (0.159)	-43.79 (978), <0.001
Wave 3	0.718 (0.184)	0.275 (0.187)	-38.47 (1339), <0.001
Wave 6	0.705 (0.206)	0.289 (0.195)	-38.70 (1393), <0.001
Wave 9	0.719 (0.189)	0.275 (0.179)	-44.86 (1395), <0.001
Involvement in serious fights in the past weeks, n (%)			Pearson Chi-Sq. value (df), p
Wave 1	139 (19.7 %)	79 (11.4 %)	18.27 (1), <0.001
Wave 2	141 (20.0%)	81 (11.7%)	17.88 (1), <0.001
Wave 3	187 (26.5%)	105 (15.2%)	27.07 (1), <0.001
Wave 6	142 (20.1%)	84 (12.1%)	16.39 (1), <0.001
Wave 9	91 (12.9%)	53 (7.7%)	10.35 (1), <0.001

SD denotes standard deviation, df, degree of freedom.

Table 2. Missing value distribution in the gender probability score

Gender Norm Score (N)	Missing Value		
Overall	Counts	Percentage	<i>p</i>^a
Wave 1 (1,330)	68	4.90	0.50
Wave 2 (981)	417	29.80	0.48
Wave 3 (1,041)	357	25.50	0.49
Wave 6 (1,395)	3	0.20	0.49
Wave 9 (1,397)	1	0.10	0.49
Men			<i>p</i>^a
Wave 1 (659)	260	6.70	0.65
Wave 2 (517)	189	26.80	0.71
Wave 3 (527)	179	25.40	0.71
Wave 6 (704)	2	0.30	0.70
Wave 9 (705)	1	0.10	0.71
Women			<i>p</i>^a
Wave 1 (671)	21	3.0	0.34
Wave 2 (464)	228	32.90	0.25
Wave 3 (514)	178	25.70	0.27
Wave 6 (691)	1	0.10	0.29
Wave 9 (692)	0	0	0.27

^a Little's missing completely at random test was applied for missing value analysis

Table 3. Descriptive statistics and correlations between the gender percentile scores at each wave.

Waves	n	Mean (SD)	Pearson Correlation Coefficient				
			Wave 1	Wave 2	Wave 3	Wave 6	Wave 9
Wave 1 (Overall)	1330	0.500 (289)	-	-	-	-	-
Wave 2 (Overall)	981	0.500 (289)	0.535**	-	-	-	-
Wave 3 (Overall)	1041	0.500 (289)	0.502**	0.735**	-	-	-
Wave 6 (Overall)	1395	0.500 (289)	0.433**	0.680**	0.656**	-	-
Wave 9 (Overall)	1397	0.500 (289)	0.472**	0.677**	0.658**	0.619**	-
			Wave 1	Wave 2	Wave 3	Wave 6	Wave 9
Wave 1 (Men)	659	0.655 (0.243)	-	-	-	-	-
Wave 2 (Men)	517	0.722 (0.177)	0.132*	-	-	-	-
Wave 3 (Men)	527	0.718 (0.185)	0.186**	0.302**	-	-	-
Wave 6 (Men)	704	0.706 (0.206)	0.024	0.204**	0.261**	-	-
Wave 9 (Men)	705	0.719 (0.190)	0.039	0.191**	0.162**	0.164**	-
			Wave 1	Wave 2	Wave 3	Wave 6	Wave 9
Wave 1 (Women)	671	0.347 (0.246)	-	-	-	-	-
Wave 2 (Women)	464	0.252 (0.159)	0.241**	-	-	-	-
Wave 3 (Women)	514	0.275 (0.187)	0.169**	0.255**	-	-	-
Wave 6 (Women)	691	0.290 (0.195)	0.144**	0.264**	0.195**	-	-
Wave 9 (Women)	692	0.276(0.180)	0.184**	0.099*	0.168**	0.129**	-

* $p < 0.05$; ** $p < 0.01$

SD denotes standard deviation

Table 3. Differences in the mean percentile scores between those with and without involvement in serious fighting with others in the past weeks

		<i>%</i>	<i>Mean (SD)</i>	<i>t (df)</i>	<i>p</i>	<i>95% CI</i>
<i>Wave 1</i>	Yes	15.6	0.56 (0.02)	-3.47 (1327)	0.001	-0.11 -- -0.03
	No	84.3	0.48 (0.01)			
<i>Wave 2</i>	Yes	15.9	0.59 (0.02)	-4.39 (972)	<0.001	-0.15 -- -0.05
	No	84.1	0.48 (0.01)			
<i>Wave 3</i>	Yes	20.9	0.57 (0.02)	-4.19 (1039)	<0.001	-0.13 -- -0.04
	No	79.1	0.48 (0.01)			
<i>Wave 6</i>	Yes	16.2	0.55 (0.02)	-2.97 (1393)	0.003	-0.10 -- -0.02
	No	83.8	0.49 (0.01)			
<i>Wave 9</i>	Yes	10.3	0.58 (0.02)	-3.74 (1395)	<0.001	-0.014 -- -0.04
	No	89.7	0.49 (0.01)			

SD denotes standard deviation; *CI*, confidence interval; *df*, degree of freedom.

Table 6. Comparing the association between having a male best friend and gender expression

	Male			Female		
	β co-efficient	SE	95% CI	β co-efficient	SE	95% CI
Wave 1- Having male best friend	0.129	0.009	0.003- 0.226	-0.041	0.072	-0.182- 0.100
Wave 2- Having male best friend	0.172	0.036	0.101- 0.243	0.830	0.053	-0.022- 0.187
Wave 3- Having male best friend	0.130	0.035	-0.062- 0.199	0.093	0.047	0.000- 0.186
Wave 6- Having male best friend	0.158	0.028	0.103- 0.214	0.091	0.035	0.021-0.160
Wave 9- Having male best friend	0.051	0.021	0.010- 0.091	0.015	0.033	-0.050- 0.080

SE denotes standard error; CI, confidence interval

Table 7. Characteristics of the GBTM for gender norms over time.

Descriptions	GTBAS* Trajectory Groups			
	Group 1	Group 2	Group 3	Group 4
<i>Number of observations</i>	103	835	156	235
<i>Average posterior probability value</i>	0.705	0.714	0.704	0.611
<i>Odds of correct classification</i>	28.389	14.751	21.007	7.297
<i>Proportion assigned to group**</i>	0.078	0.628	0.117	0.177
<i>Expected number***</i>	0.078	0.548	0.102	0.272

Note: *GTBAS, Gender-Typed Behavior and Attitudinal Scale

**The Proportion assigned to group was according to the maximum posterior probability assignment rule

*** Expected number based on the sums of the posterior probabilities

Table 8. Demographic information of the participants within the GTBAS trajectories (n=1,393).

Characteristics	GTBAS* Trajectories				P-value
	Group 1	Group 2	Group 3	Group 4	
Age	13.24 (0.43)	13.30 (0.49)	13.27 (0.46)	13.30 (0.49)	0.422 ‡
Sex					
Male	29 (65.91)	182 (49.46)	35 (47.30)	58 (53.70)	0.173 †
Female	15 (34.09)	186 (50.54)	39 (52.70)	50 (46.30)	
School Address					
Taipei City	29 (31.87)	309 (41.53)	44 (30.77)	76 (34.86)	0.010 †
Taipei County	35 (38.46)	300 (40.32)	72 (50.35)	105 (48.17)	
Yilan City and County	27 (29.67)	135 (18.15)	27 (18.88)	37 (16.97)	
Income Level					
Low Level	14 (29.17)	124 (25.05)	18 (22.78)	43 (30.94)	0.256 †
Lower-middle Level	5 (10.42)	71 (14.34)	5 (6.33)	19 (13.67)	
Upper-middle Level	6 (12.50)	77 (15.56)	20 (25.32)	16 (11.51)	
Lower-high Level	10 (20.83)	94 (18.99)	20 (25.32)	25 (17.99)	
Upper-high Level	13 (27.08)	129 (26.06)	16 (20.25)	36 (25.90)	
Father's Education					
Undergraduate	33 (41.25)	276 (40.06)	52 (40.31)	87 (44.16)	0.937 †
College Graduate	28 (35.00)	251 (36.43)	50 (38.76)	65 (32.99)	
Graduate Level	19 (23.75)	162 (23.51)	27 (20.93)	45 (22.84)	
Mother's Education					
Undergraduate	38 (46.34)	297 (42.86)	55 (42.64)	89 (43.84)	0.952 †
College Graduate	28 (34.15)	269 (38.82)	54 (41.86)	78 (38.42)	
Graduate Level	16 (19.51)	127 (18.33)	20 (15.50)	36 (17.73)	
BMI					
Underweight (<20)	22 (23.91)	220 (29.65)	41 (29.50)	65 (30.81)	0.663 †
Normal (20-25)	59 (64.13)	432 (58.22)	87 (62.59)	125 (59.24)	
Overweight (>25)	11 (11.96)	90 (12.13)	11 (7.91)	21 (9.95)	
Health Behavior Outcomes					
**					
Self-reported Health	2.44 (0.99)	2.25 (0.94)	2.36 (1.05)	2.24 (0.91)	0.166 ‡
Self-reported Happiness	2.09 (0.79)	2.07 (0.75)	1.96 (0.68)	2.12 (0.81)	0.103 ‡
Depressive Symptomology	22.75 (6.44)	23.17 (6.95)	23.03 (6.75)	22.52 (6.86)	0.772 ‡
Deviant Behavior	6.52 (1.50)	6.39 (1.10)	6.53 (2.09)	6.47 (1.29)	<0.001 ‡

Note:

Data presented in Mean (Standard Deviation, SD); frequency (Percentage, %).

Result presented in the table was analyzed using wave 1.

†Chi- square test, ‡One-way ANOVA.

* GTBAS, Gender-Typed Behavior and Attitudinal Scale.

** Health behavior outcomes ranged was from poor outcome (lowest value) to best outcome (highest value): Self-reported health (1-5); Self-reported happiness (1-4); Depressive symptomology (1-80); and Deviant behavior (1-25).

Table 9. Association of performing gender norms on psychological and health behavior outcomes using the final WAVE.

Variables	β	95% CI		p-value
		Lower	Upper	
<i>Self-reported health</i>				
Persistently moderate gender norm	1			
Non-conforming gender norm	-0.162	-0.666	0.341	0.525
Persistently conforming gender norm	-0.224	-0.552	0.103	0.178
Declining from high-to-low gender norm	-0.065	-0.316	0.187	0.612
<i>Self-reported happiness</i>				
Persistently moderate gender norm	1			
Non-conforming gender norm	-0.278	-0.788	0.232	0.284
Persistently conforming gender norm	0.114	-0.218	0.446	0.499
Declining from high-to-low gender norm	0.211	-0.044	0.466	0.104
<i>Depressive symptomology</i>				
Persistently moderate gender norm	1			
Non-conforming gender norm	0.716	-3.287	4.719	0.725
Persistently conforming gender norm	3.237	0.081	5.892	0.014
Declining from high-to-low gender norm	0.981	-1.018	2.980	0.335
<i>Deviant behavior</i>				
Persistently moderate gender norm	1			
Non-conforming gender norm	0.250	-0.804	1.305	0.641
Persistently conforming gender norm	-0.303	-0.283	0.990	0.385
Declining from high-to-low gender norm	0.478	-0.049	1.004	0.075

Note:

CI denotes confidence interval.

Result was adjusted to the following covariates: age, sex, income level, address, father's education, mother's education, and level of BMI.

Table 10. Friendship network dynamics submodel

	β	SE
Network features		
Out-degree (density)	-3.25 ***	-0.383
In-degree (popularity)	-0.06	-0.112
Reciprocity	2.39 ***	-0.099
Gender (received nominations)	0.09	-0.116
Gender (sent nominations)	0.28*	-0.138
Gender (similarity)	1.01 ***	-0.12
Pubertal development (received nominations)	0.09	-0.065
Pubertal development (sent nominations)	-0.01	-0.066
Pubertal development (similarity)	0.04	-0.105
Gender performance (received nominations)	-0.06	-0.079
Gender performance (sent nominations)	-0.05	-0.058
Gender performance (similarity)	-0.36	-0.396

Table 11. Gender performance dynamics submodel

	β	SE
BMI change (linear shape) ^{3A}	-0.01	-0.271
BMI change (quadratic shape)	-0.09	-0.149
Effect from male peers	1.3	-0.14
Effect from pubertal timing	-0.17	-0.408
Effect for peers' gender performance	0.15	-0.484

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國家科學及技術委員會補助計畫衍生研發成果推廣資料表

日期： 年 月 日

國家科學及技術委員會補助計畫	計畫名稱： 計畫主持人： 計畫編號： 領域：		
研發成果名稱	(中文)		
	(英文)		
成果歸屬機構		發明人 (創作人)	
技術說明	(中文) (200-500字)		
	(英文)		
產業別			
技術/產品應用範圍			
技術移轉可行性及預期效益			

註：本項研發成果若尚未申請專利，請勿揭露可申請專利之主要內容。

國家科學及技術委員會補助專題研究計畫成果彙整表

計畫主持人：蔡孟哲		計畫編號：110-2629-B-006 -001 -			
計畫名稱：台灣青少年交友網絡與縱貫性健康影響：探索表現性別規範的角色(L03)					
		成果項目	量化	單位	質化 (說明：各成果項目請附佐證資料或細項說明，如期刊名稱、年份、卷期、起訖頁數、證號...等)
國內	學術性論文	期刊論文		篇	請附期刊資訊。
		研討會論文			
		專書		本	請附專書資訊。
		專書論文		章	請附專書論文資訊。
		技術報告		篇	
		其他		篇	
國外	學術性論文	期刊論文	3	篇	投稿中(Asian Journal of Social Health and Behavior、Pediatrics and Neonatology、Global Mental Health)請附期刊資訊。
		研討會論文			
		專書		本	請附專書資訊。
		專書論文		章	請附專書論文資訊。
		技術報告		篇	
		其他		篇	
參與計畫人力	本國籍	大專生		人次	請填寫依「國家科學及技術委員會補助專題研究計畫研究人力約用注意事項」所實際約用專任、兼任人員。
		碩士生			
		博士生			
		專任人員(博士級)			
		專任人員(非博士級)	1		
	非本國籍	大專生			
		碩士生			
		博士生	1		
		專任人員(博士級)			
		專任人員(非博士級)			
其他成果					
(無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)					

國家科學及技術委員會補助專題研究計畫

執行國際合作與移地研究心得報告

日期： 年 月 日

計畫編號	NSTC — — — — —		
計畫名稱			
出國人員 姓名		服務機構 及職稱	
出國時間	年 月 日至 年 月 日	出國地點	
出國研究 目的	<input type="checkbox"/> 實驗 <input type="checkbox"/> 田野調查 <input type="checkbox"/> 採集樣本 <input type="checkbox"/> 國際合作研究 <input type="checkbox"/> 使用國外研究設施		

一、執行國際合作與移地研究過程

二、研究成果

三、建議

四、本次出國若屬國際合作研究，雙方合作性質係屬：(可複選)

- 分工收集研究資料
- 交換分析實驗或調查結果
- 共同執行理論建立模式並驗證
- 共同執行歸納與比較分析
- 元件或產品分工研發
- 其他 (請填寫) _____

五、其他

國家科學及技術委員會補助專題研究計畫出席國際學術會議

心得報告

日期： 年 月 日

計畫編號	NSTC — — — — —		
計畫名稱			
出國人員 姓名		服務機構 及職稱	
會議時間	年 月 日至 年 月 日	會議地點	
會議名稱	(中文) (英文)		
發表題目	(中文) (英文)		

一、參加會議經過

二、與會心得

三、發表論文全文或摘要

四、建議

五、攜回資料名稱及內容

六、其他

國家科學及技術委員會補助專題研究計畫執行出國參訪及考察

心得報告

日期： 年 月 日

計畫編號	NSTC — — — — —		
計畫名稱			
出國人員 姓名		服務機構 及職稱	
出國時間	年 月 日至 年 月 日	出國地點	

一、參訪及考察過程

二、心得

三、建議

四、其他

國家科學及技術委員會補助專題研究計畫

國外學者來臺訪問成果報告

日期： 年 月 日

計畫編號	NSTC — — — — —		
計畫名稱			
邀訪學者 姓名		服務機構 及職稱	
國籍		來臺時間	年 月 日至 年 月 日
來訪目的 (可複選)	<input type="checkbox"/> 技術指導 <input type="checkbox"/> 實驗設備設立 <input type="checkbox"/> 計畫諮詢/顧問 <input type="checkbox"/> 學術演講 <input type="checkbox"/> 國際會議主講員 <input type="checkbox"/> 其他		

一、訪問過程

二、對本項專題計畫產生之影響、貢獻或主要成果

三、建議

四、其他

**國家科學及技術委員會補助研究計畫
涉及臨床試驗之性別分析報告**

計畫編號	NSTC - - - - -			
研究人員 姓名				
任職機關 系所		職稱		
計畫名稱				
<p>說明：</p> <p>本年度專題研究計畫涉及臨床試驗且進行性別分析，請於計畫進度報告/成果報告時一併繳交「性別分析報告」。</p>				
項次	項	目	說明	備註
1	本計畫之研究結果已進行性別分析。			
2	本計畫之收案件數及其性別比例。			
3	本計畫研究結果之性別差異說明。 如無性別差異，亦請說明。			

日期： 年 月 日

110年度專題研究計畫成果彙整表

計畫主持人：蔡孟哲		計畫編號：110-2629-B-006-001-			
計畫名稱：台灣青少年交友網絡與縱貫性健康影響：探索表現性別規範的角色(L03)					
成果項目		量化	單位	質化 (說明：各成果項目請附佐證資料或細項說明，如期刊名稱、年份、卷期、起訖頁數、證號...等)	
國內	學術性論文	期刊論文	3	篇	投稿中
		研討會論文	0		
		專書	0	本	
		專書論文	0	章	
		技術報告	0	篇	
		其他	0	篇	
國外	學術性論文	期刊論文	0	篇	
		研討會論文	0		
		專書	0	本	
		專書論文	0	章	
		技術報告	0	篇	
		其他	0	篇	
參與計畫人力	本國籍	大專生	0	人次	
		碩士生	0		
		博士生	0		
		博士級研究人員	0		
		專任人員	1		研究助理，負責整理資料與庶務
	非本國籍	大專生	0		
		碩士生	0		
		博士生	1		負責驗研究分析與撰寫
		博士級研究人員	0		
		專任人員	0		
其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)					