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A 100-day mentoring program leads to positive shifts in girls' perceptions and attitudes towards biomechanics and related STEM disciplines

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ABSTRACT

The gender gap in STEM (Science, Technology, Engineering, and Mathematics) is among the widest across education and professional fields, with an underrepresentation of girls and women, particularly in engineering and biomechanics. This issue begins early in education and worsens as females progress into more senior roles. To address this gap, we designed and implemented the Biomechanics Research and Innovation Challenge (BRInC), a 100-day STEM program focused on mentoring and role modelling to engage high school girls and early-career biomechanists at key phases where they most commonly disengage in STEM. We evaluated the influence of the program on (i) identity and perceptions towards science, engineering, and biomechanics; (ii) attitudes towards biomechanics, maths and science; and (iii) attitudes towards gender bias, education and career aspirations in STEM, within high school girls following participation in the BRInC program. We observed significant and positive shifts in girls' perceptions of both biomechanics and engineering. Participation in the program appeared to lead to favourable shifts in attitudes towards biomechanics, maths, and science and fostered a positive influence on girls' education and career aspirations, igniting an interest in future research opportunities. Innovative STEM engagement programs, such as BRInC, highlight the promising potential of targeted and bespoke approaches to address the underrepresentation of females in biomechanics and STEM-related education and careers. Future programs should strive to enhance socioeconomic and cultural diversity, employ whole of life-cycle approaches by offering programs for girls and women at various phases of the STEM pathway, and prioritize impact assessments to effectively monitor progress.

1. Introduction

The gender gap in STEM (Science, Technology, Engineering, and Mathematics) occupations is among the widest across professional fields, with a noticeable underrepresentation of girls and women, particularly in engineering and biomechanics education and careers (Wang and Degol, 2017). Girls and women are underrepresented at all stages of the STEM pathway, from schooling through to tertiary education and employment. In Australia, girls make up only 25 % of enrolments in Year 12 information technology, physics and engineering classes and 37 % of enrolments in university STEM courses (Australian Government, 2023). In 2023, only 15 % of STEM-qualified jobs in the Australian professional workforce were held by women and the gap between women's and men's salaries in STEM industries was $27,012 (17 %) (Australian Government, 2023). Yet, gender diversity fosters innovation and creativity; women bring unique perspectives, experiences, and attitudes to STEM disciplines, fuelling innovation and driving progress to advance these fields (Swartz et al., 2019). One potential mechanism to close the gender STEM gap is to provide early opportunities to increase awareness and participation in STEM activities.

Biomechanics is the application of mechanical principles to the study of living organisms and integrates elements from the various domains of STEM. Specifically, it combines engineering, physics, and mathematics together with biology to understand the movement of animals and humans. Biomechanics has incredibly diverse applications spanning from enhancing sports performance to developing treatments for movement pathologies to designing wearable assistive devices to restore function. Biomechanics tends to suffer from a lack of exposure (DeVita

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2018) and is not an obvious field of study or career path. Yet, biomechanics has seen an increase in female participation, with the proportion of female graduate students rising from 5.4 % in 1977 to 27 % in 2020 (MacMillan, 2011) and the percentage of female members in the International Society of Biomechanics increasing from 21 % in 2004 to 39 % in 2022 (Steele and Challis, 2023). Despite the promising increase in participation of women in biomechanics, there has been limited progress in improving the participation of girls and women along the STEM pathway more broadly. Targeted programs that integrate STEM activities, through a biomechanics lens, provide an exciting framework to expose and encourage more girls and women to consider courses or professions in biomechanics and STEM.

The causes of the inadequate attraction and retention of girls and women along the STEM pathway originates early on in one's education and has been likened to a "leaky pipeline" (OECD, 2019). Girls and women tend to "leak" out of the STEM pipeline at several stages from early education through to higher education, career entry, promotion, and leadership positions within STEM fields. The factors that contribute to these "leaks" are complex and differ along the STEM pathway. In the early stages of education, participation in STEM is impacted by a lack of knowledge and awareness as to what a career in STEM might involve (Blotnicky et al., 2018). However, the underrepresentation of women at later stages has been attributed to a complex interaction of stereotypes, cultural factors, sociological barriers (Carlana, 2019), as well as lack of encouragement and absence of prominent women role models (Madgavkar et al., 2019). For example, the lack of visibility of women in professional STEM careers decreases women's self-identification and connectedness to the field (Stout et al., 2011). Perpetuation in the gender gap across multiple stages from schooling to university undergraduate programs to postgraduate studies culminates in the disproportionate gender landscape in today's STEM workplaces and the particularly small proportion (23 %) of senior leadership positions in STEM-qualified industries held by women (Australian Government, 2023). Providing early opportunities for girls to explore and actively participate in STEM holds promising potential for reshaping perceptions and attitudes, ultimately encouraging increased involvement in STEM education and professions.

To address this gap, we designed and implemented the Biomechanics Research and Innovation Challenge (BRInC) program to engage Year 9 and 10 high school girls and early-career biomechanists (i.e., operationally defined as those within 10 years of completing a PhD or within 5 years of commencing an academic or industry position). We purposefully targeted these two groups as they represent critical stages whereby girls and women have been shown to disengage or diverge from studies or careers in STEM. In this program, high school girls across Australia were mentored by women biomechanists from Australian universities or industry specialists. Through this mentorship, the BRInC program (detailed previously (Coltman et al., 2023)) aimed to expose girls to the exciting world of biomechanics and concurrently, build the leadership skills of early career women working in the biomechanics field. In this study, we focused on the impact of the program on the high school girls (mentees). Specifically, the aims of this study were to evaluate the changes in:

(i) identity and perceptions towards science, engineering, and biomechanics;
(ii) attitudes towards biomechanics, maths, and science;
(iii) attitudes towards gender bias, education, and career aspirations in STEM,

within mentees following participation in BRInC program.

2. Methods

2.1. Participants

We recruited one hundred Year 9 and 10 girls (14–16 years old) from 12 schools across Australia to the BRInC program (Coltman et al., 2023). The program ran over 100 days (May to August 2022). Prior to the program commencing, 8 girls withdrew and 4 girls joined meaning that 96 girls commenced the 2022 BRInC program. Over the course of the program, a further nine girls left the program, with a total of 87 girls completing BRInC (Fig. 1). Full details regarding the program framework have been previously published (Coltman et al., 2023). In brief, mentees worked in small teams to conduct a self-selected biomechanics-related research and/or innovation project with the support and guidance of their mentor/s and attended a series of workshops, with most teams visiting a biomechanics laboratory in person or virtually. Mentors were provided with resources and support for effective mentorship including a mentor resource package, bespoke mentor mindset checklist, weekly catch-up sessions with other mentors and BRInC leadership team, as well as workshop training on how to effectively use the tools and resources provided. Workshops delivered to the mentees were led by the BRInC leadership team; the covered topics included: (i) BRInC kick-starter, (ii) design thinking, (iii) business model canvas, and (iv) story telling and presentation skills. 82 % of teams were mentored in-person or through a combination of in-person and online sessions, while 18 % were mentored exclusively online. On average, teams had 11 mentoring sessions, mostly at their schools, with 76 % of teams conducting in-

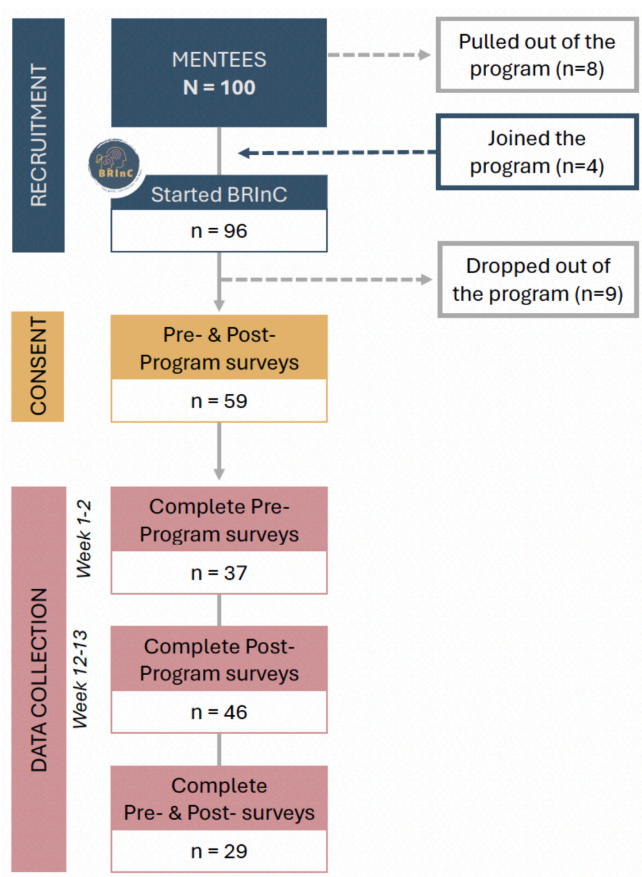

Fig. 1. Overview of participant recruitment and data collection in the BRInC program. One hundred Year 9 and 10 girls were recruited to the BRInC program. Prior to the program commencing, 8 girls withdrew and 4 girls joined, such that 96 girls commenced BRInC. Over the course of the program, 9 girls left the program, with a total of 87 girls completing the BRInC program in 2022.

person university laboratory visits for tours and/or data collection. The program concluded with the BRInC showcase, an online event whereby each team created and shared a video-based presentation showcasing their BRInC project and journey.

Pre- and post-program online surveys

We invited Year 9–10 girls enrolled in the BRInC program to participate in pre- and post-program closed surveys via Written informed consent was obtained from both the girls and their parent/guardian prior to program commencement (University of Canberra Human Research Ethics Committee ID: 9338). This study is reported according to the Checklist for Reporting Results of Internet E-Surveys (Eysenbach, 2004). Pre- and post-program surveys were adapted from survey instruments used in other STEM-related outreach programs (e.g., Standford RISE, Teeter et al., 2020) and administered through Qualtrics (v0217; Provo, UT, USA). Survey questions, outlined in Supplementary Table 1, encompassed four areas: (i) demographics (Q1-7), (ii) identity and perceptions towards science, engineering, and biomechanics (Q8), (iii) attitudes towards biomechanics, maths and science (Q9-11), and (iv) attitudes towards gender bias, education and career aspirations in STEM (Q12-13). For all statements, participants were asked to indicate their agreement on a 5-point Likert scale (rated from strongly agree to strongly disagree). We also assessed the influence of the program on participants future plans to undertake research at university (Q14).

2.2. Data analysis

Demographic characteristics are presented with frequency and percentage for categorical variables, and median and interquartile range (IQR) for continuous variables. Normality of the quantitative variables was tested using Shapiro-Wilk test. Responses for items within each theme of the identity and perceptions questions (Scientist/Engineer identity, Engineering perception, Biomechanics perception) were averaged together for each participant to create an aggregate score ranging from 1 to 6 (1 = Strongly agree; 2 = Agree; 3 = Slightly agree; 4 = Slightly disagree; 5 = Disagree; 6 = Strongly disagree, (Teeter et al., 2020)). As this was an exploratory analysis, pre- and post-program measures were compared using a Wilcoxon Signed Rank Test with alpha set at 0.05. This analysis was only performed on the matched pre-post responses (n = 29).

Pre- and post-program responses were recoded to calculate positive and negative changes over the program. Differences in pre-post program attitudes toward biomechanics (Q9), maths (Q10), and science (Q11), as well as gender bias (Q12), and education and career aspirations in STEM (Q13) (Supplementary material Table 1) were calculated at an individual participant level, whereby positive values represented more agreement post program, and negative values represent less agreement post program. No change in attitude was represented by "0″ scores. Given that we did not combine scores to create an aggregate value for the attitudes questions, some categories have zero observations. This precludes formal statistical analysis between pre- and post-program responses and thus we report the frequency of positive changes/more agreement post program. Data was processed in STATA (StataCorp, 2013, Stata Statistical Software).

3. Results

Survey response rate

Thirty-seven girls (38 % of program participants) completed the pre-program survey prior to the start of the BRInC program, and 46 girls (48 % of program participants) completed the post-program survey after the completion of the program. Twenty-nine girls (30 % of program participants) completed both surveys (Fig. 1), and their sociodemographic characteristics are presented in Table 1.

Identity and perceptions towards science, engineering, and biomechanics

The aggregated scores for the self-identity and perceptions questions are presented in Table 2 with the detailed frequency of responses to pre- and post-program questions provided in Supplementary Table 2. We found no change in self-identification as a scientist or engineer (Z=1.69, p = 0.09). However, following the BRInC program, respondents rated *engineering more interesting*, and found *engineers more creative and helpful* (Z=2.87, p < 0.01) when compared to the start of the program. For example, the number of respondents who strongly agreed with the statement *engineering is interesting* doubled, increasing from 20.7 % of respondents at the start of the program to 41.4 % following the program's completion (Supplementary Table 2). Positive shifts in perceptions towards biomechanics were also demonstrated, with respondents agreeing more strongly to statements regarding their *understanding* of biomechanics, whether it is *interesting and fun*, and a *good career option* (Z=2.46, p = 0.01). For example, the number of girls who strongly agreed with the statements: *I understand what biomechanics is* and *I could explain to someone else what biomechanics is* increased by 31 % and 24.2 %, respectively, between the pre- and post-program surveys (Supplementary Table 2).

Attitudes towards biomechanics, maths, and science

Each respondents' change in attitudes towards biomechanics, maths, and sciences are presented Fig. 2 with the detailed frequency of responses to the pre- and post-program questions provided in Suppl. Table 3.

Following the program, biomechanics tended to be considered *more interesting, more valuable, more understandable, more exciting,* and *less dull.* The number of respondents who strongly agreed with the statements *Biomechanics is interesting, valuable,* or *exciting* increased by 17.3 %, 13.8 %, and 6.9 %, respectively and the number of respondents who strongly agreed or somewhat agreed with the statement *Biomechanics is*

Table 1
Participant sociodemographic characteristics.

	Pre-Program Survey (n = 37)	Post-Program Survey (n = 46*)	Pre- & Post-Program Survey (n = 29)
Age (years) [a*]	15 (14–15)	15 (14–15)	15 (14–15)
Grade [b]	22	24	20
9th (age 14–15)10th	(59.5)15	(52.2)15	(69)9
(age 15–16)	(40.5)	(32.6)	(31)
Disability (No) [b]	35 (94.6)	37 (80.4)	27 (93.1)
Ethnicity [b]			
Asian	10 (27)	13 (28.2)	8 (27.6)
Non-Indigenous Australian	10 (27)	12 (26.1)	9 (31)
Indian	5 (13.5)	3 (6.5)	2 (6.9)
New Zealander	2 (5.4)	1 (2.2)	1 (3.4)
European	2 (5.4)	1 (2.2)	1 (3.4)
Middle Eastern	1 (2.7)	1 (2.2)	1 (3.4)
Indigenous Australian – Aboriginal or Torres Straight	0 (0)	1 (2.2)	0 (0)
Other	6 (16.3)	6 (13)	6 (20.7)
Prefer not to answer	1 (2.7)	1 (2.2)	1 (3.6)
English first language (Yes) [b]	30 (81.1)	32 (69.6)	24 (82.8)
Country of birth [b]			
Australia	25 (67.6)	26 (56.5)	21 (72.4)
India	3 (8.1)	0 (0)	0 (0)
China	2 (5.4)	3 (6.5)	2 (7)
Sri Lanka	1 (2.7)	2 (4.3)	1 (3.4)
United Arab Emirates	1 (2.7)	2 (4.3)	1 (3.4)
Bangladesh	1 (2.7)	1 (2.2)	1 (3.4)
Hong Kong	1 (2.7)	1 (2.2)	1 (3.4)
Ireland	1 (2.7)	0 (0)	0 (0)
New Zealand	1 (2.7)	1 (2.2)	1 (3.4)
South Africa	1 (2.7)	1 (2.2)	1 (3.4)
Philippines	0 (0)	1 (2.2)	0 (0)

Data presented as [a] median (interquartile range) or [b] frequency (percentage). *Missing data for age (n = 7). *46 post-program surveys were received, but only 39 included responses related to demographics. Therefore, all percentages included in this column are expressed as a percentage out of 39.

Table 2
Scientist/engineer identity and perceptions toward engineering and biomechanics pre and post BRInC program (n = 29).

Scale	Questions	PRE	POST	Z	p-value
Scientist/ Engineer Identity	I see myself as a scientist I see myself as an engineer I can be a scientist if I so choose I could be a successful engineer	2.5 (2–3)	2.3 (1.8–2.8)	1.687	0.09
Engineering Perception	Engineering is interesting Engineers are creative Engineers are helpful	2 (1.7–2.3)	1.3 (1–2)	2.869	<0.01
Biomechanics Perception	I understand what biomechanics is I could explain to someone else what biomechanics is Biomechanics is a good career option Biomechanics is tedious and detail-oriented Biomechanics is interesting/fun	2.2 (1.8–2.8)	1.3 (1.8–2.2)	2.455	0.01

Data presented as median (interquartile range). Pre-post measures were compared using Wilcoxon Signed Rank Test. The Likert-type survey items were aggregated into three larger themes: Scientist and Engineer Identity, Engineering Perception, and Biomechanics Perception. Responses for the items within each grouping were averaged together for each participant to create an aggregate score ranging from 1 to 6 (1 = Strongly agree; 2 = Agree; 3 = Slightly agree; 4 = Slightly disagree; 5 = Disagree; 6 = Strongly disagree).

understandable increased by 5.2 % between the start and the completion of the program.

Several respondents rated maths *more simple,* but *less valuable* with the number of respondents who strongly agreed or somewhat agreed with the statement *Maths is simple* increasing by 11.6 % (average between strong and somewhat) but the number of respondents who strongly agreed with the statement *Maths is valuable* decreased by 20.7 % between the pre- and post-program survey.

Following the program, some of the respondents rated science, *more valuable, more difficult, more hard,* and *more easy*. The number of respondents who strongly agreed with the statements *Science is valuable, difficult, hard, easy* increased by 13.8 %, 13.8 %, 6.9 %, and 6.9 %, respectively across the program.

Attitudes towards gender bias, education, and career aspirations in STEM

Each respondents change in attitudes towards gender bias, education and career aspirations in STEM Fig. 3 with the detailed frequency of responses to the pre- and post-program questions provided in Suppl. Table 4.

There were minimal changes in attitudes towards gender bias in STEM following participation in the BRInC program with the majority (≥70 %) of girls strongly disagreeing with statements such as *STEM is more important for boys; Boys do better in STEM-related subjects than girls,* and *In the future STEM will be more useful for boys* both before and after the program. At completion of the BRInC program, there were some positive changes in attitudes towards education and career aspirations in STEM with the number of respondents who strongly agreed with the statements: *I think that a career in STEM is possible for me; I am interested in pursuing a career in STEM;* and *I am likely to study a STEM degree at university when I am older* increasing by 10.4 %, 24.1 %, and 17.2 %, respectively.

After completing the program, 84 % of girls who completed post-program survey (n = 48) reported that it was *extremely likely* or *somewhat likely that they will pursue research opportunities when they get to university*.

4. Discussion

Girls and women continue to be inadequately represented in STEM education and professional environments. The origins of poor attraction and retention of females in STEM begins early and intensifies as they advance into more senior roles in their careers. The goal of this study was to evaluate whether a 100-day STEM engagement program targeting high school girls, changed identities, perceptions, and attitudes towards biomechanics and related STEM disciplines. We demonstrated positive improvements in girls' perceptions regarding biomechanics and engineering. Participation in BRInC also appeared to lead to positive shifts in attitudes, particularly towards biomechanics, with minor changes to maths and science. The program generally fostered a positive influence on girls' education and career aspirations, igniting a broader interest in potential future research opportunities.

Identity and perceptions towards science, engineering, and biomechanics

Participants tended to agree more strongly with statements regarding whether they saw themselves as scientists or engineers following BRInC, although we did not detect a significant change in their overall self-identity as a scientist or engineer. At commencement of the program, the IQR of self-identification scores was 2 to 3, which corresponded to the responses *Agree* or *Slightly Agree* to statements such as: *I see myself as a scientist/engineer* or *I can be a scientist/engineer if I choose*. These baseline data suggests that our participants had relatively high levels of self-identity prior to commencing the program. Although our recruitment strategy was inclusive and our intention was to recruit a diverse pool of participants to the program, teachers may have encouraged highly motivated and high achieving girls to participate in the program, potentially biasing results. Students who self-opt into extra-curricular STEM programs are generally more interested and confident in science (Vallett et al., 2018). Developing a strong STEM identity at early stages in the STEM pipeline is critical as it fosters the "who I am" and "who I want to be"—important factors that help lead young women toward a STEM career in the future (Kim et al., 2018).

The program led to significant improvements in participants perceptions regarding both engineering and biomechanics. Girls' perceptions often shape how and why they participate in STEM. For example, if young girls perceive STEM fields as male-dominated, their perceptions can poorly impact their sense of identification, interest, and participation in STEM activities (Lips, 1995; Steinke, 2004; Cheryan et al., 2015; Carli et al., 2016). Further, in middle school aged girls, STEM perceptions are the strongest predictor of one's identification with STEM-related careers and this identity was positively associated with their science experiences at home, outside of school, and in school science classes (Kang et al., 2019). Although we did not demonstrate a change in identity following the BRInC program, we found positive changes in perceptions which may, in the future, translate to stronger identification and thereby STEM uptake. Future programs that strategically increase engagement with STEM and biomechanics activities outside of the traditional school environment, as was implemented here, but also target young girls with lower self-identity may lead to the most impactful changes in identity and perceptions at these early stages of the STEM pipeline.

Attitudes towards biomechanics, maths, and science

Participation in BRInC had a positive impact on the girls' attitudes towards biomechanics, and to a lesser extent on attitudes towards maths and science. The BRInC program's combined exposure to women role models working in these fields with a focus on the relevance of biomechanics in everyday life likely led to the respondents rating biomechanics as more *interesting, exciting, valuable* and *understandable*. Encountering female role models enhances girls' confidence in their

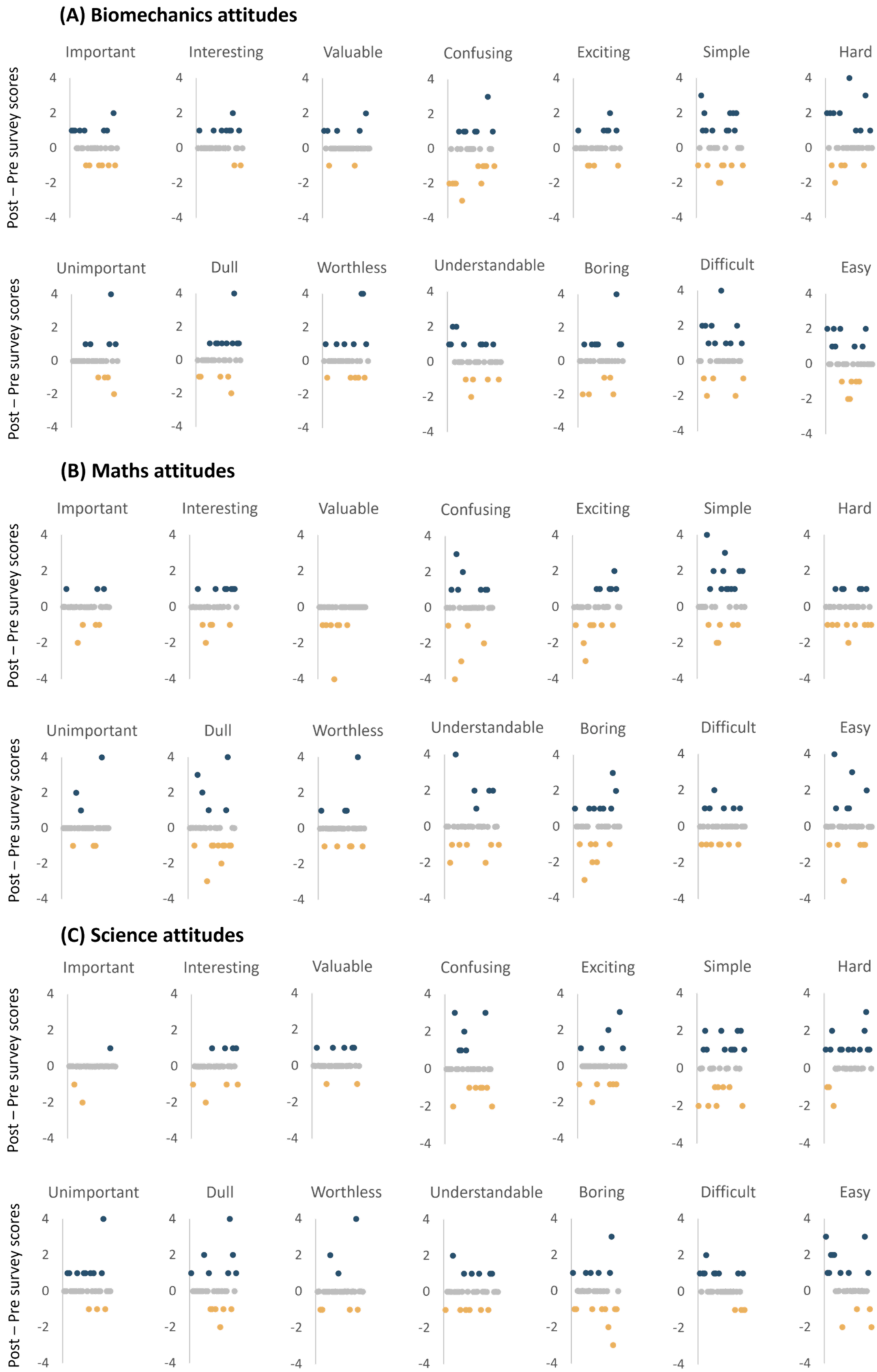

Fig. 2. Differences in pre-post program survey data (n = 29) relating to attitudes toward biomechanics (A), maths (B), and science (C). Positive values (dark blue) represent more agreement post program, and negative values (yellow) represent less agreement post program. No change is represented by “0″ scores (grey).

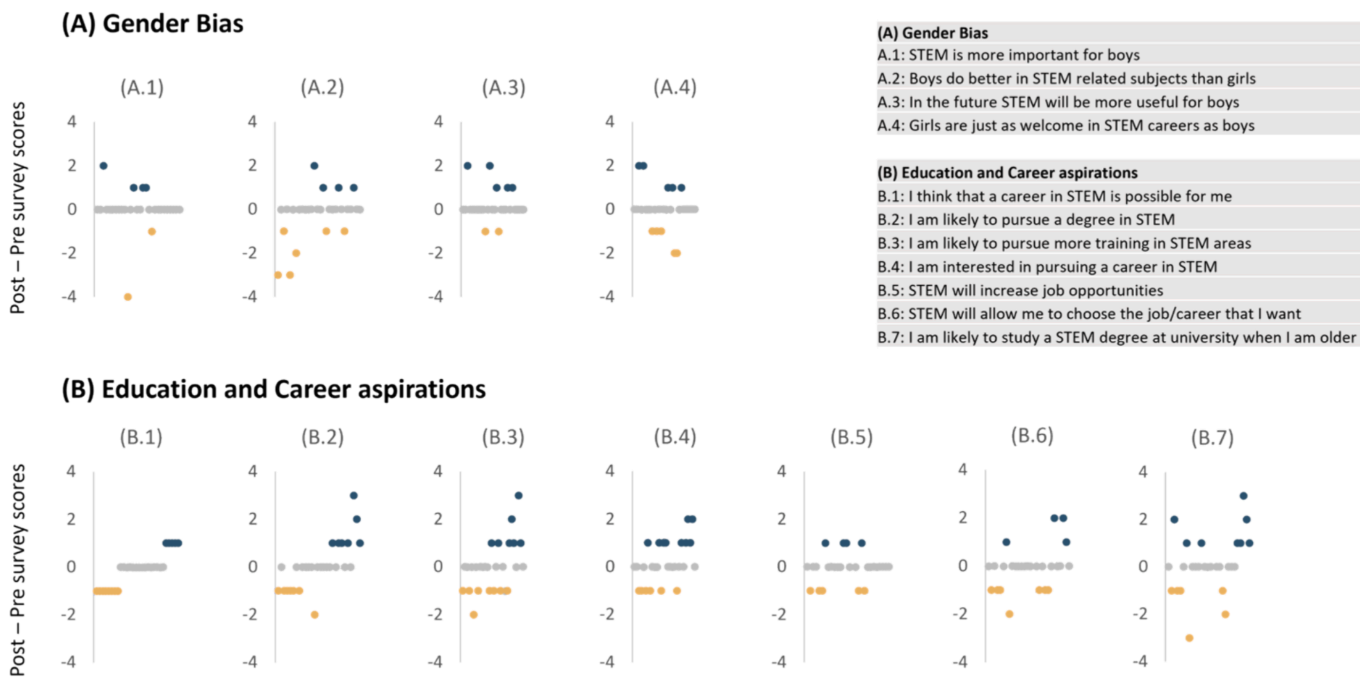

Fig. 3. Differences in pre-post program survey data (n = 28) relating to mentees attitudes towards gender bias (A), education and career aspirations (B) in STEM. Positive values (dark blue) represent more agreement post program, and negative values (yellow) represent less agreement post program. No change is represented by "0″ scores (grey).

potential success within STEM and boosts the likelihood of a future STEM career (González-Pérez et al., 2020). Exposing young girls to women in biomechanics likely fostered connectiveness and self-identification as the girls were able to see successful females in the profession, which has been previously shown to defy stereotypes (Prieto-Rodriguez et al., 2022). The 100-day duration of our program allowed the girls and mentors to develop rapport; this is distinct from other STEM-biomechanics outreach programs which often operate over shorter timescales, e.g., National Biomechanics Day (DeVita 2018; Kirk et al., 2023). Yet, there is a trade-off owing to costs, resources, and the scalability and sustainability of programs. Future studies should aim to establish the effectiveness of STEM engagement programs across different time scales.

The largest positive shifts in attitudes following completion of the program were related to biomechanics, rather than maths or science. Upon completion of BRInC, participants found biomechanics *more interesting, valuable,* and *exciting*—with the number of respondents who *strongly agreed* to these statements increasing by ~ 13 %. Although girls tended to rate science as *more hard* or *more difficult* following the program, they also found it *more easy and valuable*. This may suggest that the context where these foundational subjects are taught holds significance; however we also acknowledge the inconsistency among these responses. Evaluating program outcomes using both quantitative metrics and qualitative analysis, such as conducting participant interviews, may offer valuable insights into this observation. These insights can guide future iterations to improve consistency and achieve more favourable outcomes. The program's design purposefully avoided teaching content as it is well established that altering attitudes toward science is accomplished more effectively via increasing excitement and engagement (Besley et al., 2016). One particular engagement strategy of the BRInC program involved empowering the girls to utilize the design thinking process within an area of their interest, to develop their own biomechanics "story" thereby promoting a personal investment in the program.

Attitudes towards gender bias, education and career aspirations in STEM

The girls who participated in BRInC reported low levels of gender bias towards STEM upon commencing the program. Evidence suggests that gender bias differs between stages of the STEM pipeline, with high school girls reporting the lowest levels of bias compared to females in undergraduate or graduate university programs (Robnett, 2016). The minimal bias observed in our participants could also be related to the gender representation of schools involved in BRInC, as 5 out of total 12 schools were exclusively for girls. Male peers tend to be a more prevalent source of gender bias in STEM compared to female peers, teachers/professors, and mentors (Leader and Brown, 2008; Robnett, 2016). Female in STEM engagement programs may not need to concentrate solely on diminishing gender bias but rather emphasize exposure to role models within engaging environments that incorporate various STEM elements, such as biomechanics.

When asked about future education and career aspirations, the attitudes of girls who completed the program tended to positively shift towards considering studying STEM at university or pursuing a career in STEM—with the number of girls who *strongly agreed* to these statements increasing by ~ 17 %. These results are supported by 84 % of the girls expressing, at completion of the program, that it was *likely* that they will pursue research opportunities at university. The gender landscape at Australian universities has been undergoing substantial change—the number of females enrolling in university STEM courses increased by 31 % between 2015 and 2021 (Australian Government, 2023). Despite this, only 15 % of STEM-qualified positions are held by women. This highlights that considerable efforts are still needed to ensure girls and women are provided with opportunities to learn, work and engage in STEM across the education and career pipeline. However, improving the gender landscape requires a full ecosystem approach with a shared vision beyond academic settings and within industry sectors.

5. Limitations

The absence of a control group prevents us from directly attributing our observations to the program. The authors acknowledge that the low percentage of matched pre-post responses (~30 % response rate) limits the strength and representativeness of the results, potentially skewing the sample towards more engaged participants. This may also limit our ability to generalize these results to more diverse cohorts. One reason for this may be due to information provided to the girls early in the program and email issues, which can be addressed in future iterations. There are limitations in comparing descriptive statistics such that they are context-specific and cannot be generalized beyond this cohort of participants; it remains uncertain whether similar changes will be observed in future cohorts or if the program is implemented in different contexts or countries. Future work should aim to determine whether similar changes will be observed in future cohorts within and beyond the current Australian context. Demographics of participants may not represent the wider high school girl population. Future programs should include diverse socioeconomic, geographical, and ethnic backgrounds for comprehensive insights. Our survey used customized items, but their validity and reliability remain unknown.

6. Conclusions

Innovative STEM engagement programs, such as BRInC, demonstrate the exciting possibility to address the underrepresentation of females in biomechanics and STEM-related education and careers. Through a purposeful mentoring program that exposed high-school girls to women in the field of biomechanics, we have shown positive shifts in perceptions and attitudes towards biomechanics and related-STEM disciplines, which extend to educational and career aspirations. These girls will now be followed for 5 years to determine whether the positive shift in perceptions and attitudes translates to university or career choices, ultimately addressing the underrepresentation of women in STEM. Future programs should strive to improve the socioeconomic and cultural diversity among participants, adopt comprehensive life-cycle approaches by offering programs for girls and women at various stages of the STEM pathway, and prioritize rigorous impact assessments to monitor progress effectively.

CRediT authorship contribution statement

Taylor J.M. Dick: Writing – original draft, Writing – review and editing, Visualization, Methodology, Investigation, Funding acquisition, Formal Analysis, Data curation, Conceptualization. **Manuela Besomi:** Writing – review & editing, Writing – original draft, Visualization, Software, Formal analysis, Data curation. **Celeste E. Coltman:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Laura E. Diamond:** Writing – review & editing, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization. **Michelle Hall:** Writing – review & editing, Methodology, Investigation, Data curation, Conceptualization. **Jayishni Maharaj:** Writing – review & editing, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Crystal O. Kean:** Writing – review & editing, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Martina Barzan:** Writing – review & editing, Investigation, Funding acquisition, Conceptualization. **Karen J. Mickle:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

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

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jbiomech.2024.112244.

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