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ARTICLE

The leaky pipeline: gender ratios in UK brass playing

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Abstract
Recent research has explored gender ratios in orchestras but not specifically in brass playing, a historically masculine field. Three studies investigated gender ratios in a variety of brass-playing situations. Public domain and questionnaire data were analysed using descriptive statistics, and a chi-square test found a significant effect of instrument size on gender ratios. The highest percentage of female brass players was found in youth ensembles, followed by the freelance workforce, semi-professional brass bands and then professional orchestras, indicating a leaky pipeline effect. These results show that women are still under-represented in most brass-playing contexts, particularly the most prestigious positions, and that more can be done in music education to change this.

Keywords: music; education; brass instruments; gender inequality; gender associations

There is no doubt that the number of female brass players has increased in recent years. Even 50 years ago, women were rarely members of orchestral brass sections in the UK (Gee, 2010), and most brass bands were exclusively made up of men (Newsome, 2006). In the present day, women and girls can and do play brass instruments of every kind and in every situation, but the fact that there are more men than women in brass sections and brass bands (*brass-playing contexts*) shows that there is still no true equality of opportunity in the brass-playing world. This study uses a quantitative approach to explore the current gender ratio in UK brass playing and suggests possible reasons for the ratios found. As such, it has implications for music education policy for instrumental teaching, as well as progression into higher education.

In the present study, the researchers were not concerned with sex, as assigned at birth, but rather with the social construct of gender and how this affects the lives and careers of brass players. Because men have historically been the dominant group in this musical field, we were interested in the experiences of women and people who identify as non-binary as they negotiate their differences. However, some of the existing literature discusses *sex* rather than *gender* when referring to the balance between men and women, so the original terms will be used when referring to the work of others. Throughout this paper, the terms *female* and *male* will be used to describe people who identify as women and men respectively, while *non-binary* will be used as an umbrella term for those who do not identify with the female/male binary (Bamberger & Farrow, 2021).

Historically, there have been many musical prescriptions and proscriptions for women in the UK. In the Victorian era, women were strongly encouraged to take part in domestic music-making but generally discouraged from performing in public. Singing was considered the most feminine form of music-making (Hamer, 2021), and acceptable instruments were only those at which the musician could be seated, such as the piano and harp (Phelps, 2010). Later, it became acceptable

for women to play string instruments, and UK conservatoires began to admit female string players as students in the late 19th century (Colles, 1933; Barty-King, 1980). However, women were not yet permitted to join all-male brass bands or symphony orchestras, with the exception of some female harpists (Miller, 1971). To provide a platform for trained female musicians, women's orchestras were formed in the UK, but few wind or brass players took part (Rudd, 2017). The first professional female string players were admitted to the Queen's Hall Orchestra in London in 1913 (Jacob, 1994), and the subsequent world wars helped to increase their number in orchestras around the country. There was no record of a female brass player in any UK symphony orchestra until the 1940s when some orchestras hired women to replace men who had been called up for war service (Kennedy, 1982). After the war, women were occasionally found in symphonic brass sections, including Maisie Ringham as principal trombone in the Hallé (Salmon, 2014) and Enid Roper as a member of their French horn section (Kennedy, 1982). However, some symphony orchestras remained exclusively male until the 1970s, with no women in any instrumental section (Morrison, 2003).

In the brass band movement,[1] which emerged out of masculine working-class culture (Gee, 2010), there are records of some girls and women performing with bands before the Second World War. These were often the daughters or sisters of existing band members, but throughout the 20th century, their participation was limited to the lower-section bands (Russell, 2000). Some all-female brass bands are known to have existed in the UK, but these did not have the same status as more established male bands (Holman, 2018). In recent years, gender equality has become a more salient issue for brass bands and symphony orchestras alike. However, brass sections are still predominantly populated by men, with female musicians more likely to be found playing string and woodwind instruments (Sergeant & Himonides, 2019). In addition, some high-profile brass bands were reluctant to accept female members until very recently. The last all-male band admitted their first female member in 2011 (Titley, 2011) and one top-ranked band reported losing existing members after allowing women to join (Wainwright, 2000).

Within the sphere of music performance, there is a blurred line between the professional musician and the amateur, with many musicians occupying a position somewhere between the two assumed categories. To better understand this fluidity, Finnegan (2007) proposes a continuum between professional status and amateur status, along which musicians may move at different points in their lives. Many musicians will have a so-called day job but take paid musical engagements in their spare time, and it has been suggested that being a professional musician is more of an identity than a defined career path (Cottrell, 2004). Players in UK brass bands typically have overlapping identities. Although brass bands are required to be amateur ensembles for organised competitions (Kapitol Promotions, 2021), many high-level brass band musicians are of a professional standard and earn some of their living through other musical endeavours (Herbert, 2000). Such musicians have a direct influence on other areas of brass playing due to their prominent role in teaching young brass players, many of whom will later hold key roles themselves (Gee, 2010). However, brass bands and their music have historically been seen as outside the Western art music canon and thus represent an under-researched area of music performance (Newsome, 2006).

Several recent studies have described a gender imbalance among brass musicians. Staley and Shendruk (2018) explored the gender ratio in Gramophone Magazine's top-rated orchestras across the world. Out of 2,438 orchestral musicians, 69% were men, but the gender imbalance was far greater in brass sections. Across 22 orchestras, all tuba and trombone players were men, and there was just one female trumpeter. A similar study of orchestral musicians was undertaken by Sergeant and Himonides (2019), who surveyed 20 world-class professional orchestras in the UK, USA and Europe and analysed their findings by instrument, principal status (whether the musician is the lead player in their section) and sex. They found that, across all orchestral instruments, 57% of musicians were male and that 'males predominated in all brass sections' (p. 4). According to the analysis by instrument, 72% of horn players, 87% of trumpet players, 87% of trombone players and 90% of tuba players were men. In both studies, women were represented

to a slightly greater extent in the French horn section, but many orchestras had no women in their brass sections. A survey of brass bands found that 73.6% of UK band musicians were male, with women more heavily represented in the flugelhorn and tenor horn sections (Sergeant & Himonides, 2022). An earlier survey (Gee, 2010) also included brass band musicians and found a similar pattern, in that more female respondents played cornet, flugelhorn and tenor horn, while the lower brass band instruments such as euphonium, trombone and tuba (or bass) were predominantly played by men. Gee also investigated a sample of orchestras belonging to the Association of British Orchestras and found that there were approximately 10 men for every woman in high-profile orchestral jobs. Although these articles give a valuable picture of the gender ratio in high-level symphony orchestras and some brass bands, they do not fully explore the ratios of women to men in chamber orchestras, opera and ballet orchestras or the freelance workforce.

In music education research, there has been a strong focus on gender as it relates to children's preferences for certain musical instruments. In the late 20th century, both children and adults perceived brass instruments to be masculine, and boys were more likely to choose brass instruments than girls (Abeles & Porter, 1978; Bruce & Kemp, 1993; Harrison & O'Neill, 2000). A comprehensive study of 150 UK music services (Hallam, Rogers, & Creech, 2008) sought to investigate whether children's preferences for particular instruments had changed since the initial studies.[2] The researchers found that the trombone and tuba were still predominantly played by boys but that the cornet, French horn and tenor horn were among the least gendered brass instruments. Overall, 67% of young brass musicians were boys, whereas 60% of those learning any musical instrument were girls. A subsequent study reaffirmed these associations between gender and instrument with a smaller group of young musicians (Hallam et al., 2020) and suggested that the French horn was beginning to lose its association with the masculine gender.

Although there are more boys than girls playing brass instruments in the various stages of music education, the gender difference is far greater in adult music-making. Overall, just 17.4% of brass players in top symphony orchestras are female (Sergeant & Himonides, 2019) compared to 33% of young brass musicians (Hallam, Rogers, & Creech, 2008). Given that the proportion of girls and boys playing each brass instrument is not currently reflected in the female-to-male ratio in the symphony orchestra, it seemed important to investigate the gender ratio in brass playing more widely. Freelance musicians are notoriously hard to research but constitute the majority of professional musicians (Cottrell, 2004) and are generally the pool from which symphony orchestra musicians are drawn. Conservatoires represent another musical context where men outnumber women in the brass departments. Admissions data from UCAS Conservatoires (2021) show that, in every year since 2012, the gender ratio across all student brass players was more than 2:1 in favour of men, except in 2015, when the ratio was 3:2. However, their data do not show how conservatoires' acceptance rates vary by individual instrument or location. Many high-level youth ensembles, such as the National Youth Orchestra, the National Youth Brass Band and the National Youth Jazz Orchestra, also prepare young musicians for a professional career and draw players from a wide geographical area, but it is not clear what the gender ratio is in these ensembles.

The existing literature offers some snapshots of the gender ratio in brass playing but does not present an extensive picture of the number of women and girls who are currently active in UK brass playing. To fill this gap, the following research questions were addressed: (a) what is the current gender ratio, and (b) how does it vary by instrument, type of ensemble and the instrument's role within the ensemble (i.e. musical context) in (1) professional and semi-professional ensembles, (2) the freelance workforce and (3) high-level youth ensembles?

Three studies were conducted: Study 1, in which ensemble data in the public domain were collected; Study 2, in which membership data were requested by email from professional bodies; and Study 3, in which an online questionnaire was administered to educational institutions to collect membership data. Studies 2 and 3, which dealt with identifiable personal information not in the public domain, were granted ethical approval before data collection began. The aims,

methods and results of each of the studies will be outlined individually, before being discussed together.

Study 1

Method

The aim of this study was to determine gender ratios in professional and semi-professional ensembles in the UK including the symphony, opera, ballet and chamber orchestras listed by the Association of British Orchestras (2021), and all brass bands currently ranked in the world top 100 (Brass Stats, 2021). This criterion was applied to limit the scope of the study as, at the time, more than 600 bands were registered for the National Championships (Kapitol Promotions, 2021). World top-100 bands are ranked by the results of numerous competitions and give regular concerts, so they are typically considered semi-professional ensembles. Because of significant national differences found in previous studies (Staley & Shendruk, 2018; Sergeant & Himonides, 2019; Sergeant & Himonides, 2022), participation in the present study was limited to brass musicians living in the UK.

We followed the example of Sergeant and Himonides (2019) by gathering data relating to brass-playing members from each ensemble's website. The name and location of each ensemble were recorded, as were the gender, instrument and principal status of each brass player. In most cases, a musician's gender was easily identifiable from the pronouns in their biography. For ensembles where biographies were not available, the musician's gender was verified using online networking sites such as LinkedIn, Music Tutors and Facebook, which display the musician's pronouns. In several brass bands without a strong digital presence, this information was not available, so these ensembles were excluded to obviate the need for the researchers to infer gender from individuals' names or appearances.

Recording the principal status of each individual required a level of interpretation from the researchers. Brass bands distinguish between so-called section seats and the more prominent solo seats, but many bands also had named principal seats. Orchestral brass sections used a variety of names for the lead player of each instrument: section leader, section principal and principal were all in common usage. Because there was such variety in these labels, industry knowledge was used to group the positions into three groups: *principal*, *sub-principal* or *solo* and *section*. These groupings reflect the different levels of prestige for each seat and also the relevant pay grade where applicable. Vacancies and pending appointments were omitted from the data.

Results

Altogether, 1,349 individuals were recorded, along with their ensemble, instrument, principal status and gender. This consisted of 40 orchestras and 44 brass bands, in which a total of 296 orchestral musicians and 1,053 brass band musicians were represented. However, the distribution of brass players in each ensemble varied considerably. The smallest chamber orchestras only listed one or two brass players, a symphony orchestra typically had 11 or 12 players and a brass band could have up to 26 players if there were no vacancies. The number of each instrument also varied, with a brass band typically having 9 or 10 cornets but only one flugelhorn. The breakdown of brass musicians by gender and instrument can be seen in Table 1. A preliminary analysis of the gender ratio showed that brass musicians in brass bands and orchestras are still predominantly men. In total 25.5% of brass players were women, but 10.5% of orchestral brass players were women, compared to 29.6% of brass band players.

As shown in Table 2, the pattern of instruments played by women in orchestras followed previously identified trends, with more women playing the French horn (15.7%) than the trumpet (7.9%) or trombone (7.7%). There were no female tuba players in any UK orchestra. The type of

Table 1. Gender Distribution by Instrument (from Smallest to Largest) in Orchestras and Brass Bands

	Women		Men		Non-binary		Total	
Instrument	*n*	%	*n*	%	*n*	%	*n*	%
Cornet	134	32.1	282	67.5	2	0.5	418	100
Trumpet	6	7.9	70	92.1	0	0	76	100
Flugelhorn	28	70	12	30	0	0	40	100
Tenor horn	71	56.3	55	43.7	0	0	126	100
French horn	19	15.7	102	84.3	0	0	121	100
Baritone	41	46.6	47	53.4	0	0	88	100
Euphonium	9	10.8	74	89.2	0	0	83	100
Trombone	**26**	**12.4**	**183**	**87.6**	**0**	**0**	**209**	**100**
Tuba	**8**	**4.3**	**179**	**95.2**	**1**	**0.5**	**188**	**100**
Total	342	25.5	1004	74.3	3	0.2	1349	100

Note: Instruments in bold can be found in both brass bands and orchestras.

Table 2. Gender Distribution by Instrument – Orchestra Only

	Women		Men		Non-binary		Total	
Instrument	*n*	%	*n*	%	*n*	%	*n*	%
Trumpet	6	7.9	70	92.1	0	0	76	100
French horn	19	15.7	102	84.3	0	0	121	100
Trombone	6	7.7	72	92.3	0	0	78	100
Tuba	0	0	21	100	0	0	21	100
Total	31	10.5	265	89.5	0	0	296	100

orchestra also affected the gender ratio in its brass section. In chamber orchestras, 18.2% of brass players were women, but in opera and ballet orchestras, only 10.1% were women, and in symphony orchestras, only 8% (Table 3). Analysing the data by principal status made a small difference in the percentage of women, with slightly more women in section seats (12.8% of brass players) than in sub-principal seats (10.7%) or principal seats (9.6%). Thirteen orchestras had a brass section consisting entirely of men, and another 19 had only one female brass player. The maximum number of women in any one brass section was two, even in the biggest section of 14 players. Only two small chamber orchestra sections had more women than men, one with only one brass player listed and one with three players in total. This shows very little variation between orchestras, with an under-representation of women in nearly every orchestra.

As with orchestras, the number of women varied hugely between brass band sections (Table 4). The largest percentages of women were to be found in the flugelhorn (70%) and tenor horn sections (56.3%), which were the only two instrument groups containing more women than men. The baritone section was roughly gender-balanced (46.6% women), but the other four instrumental groups were predominantly populated by men. The tuba (bass) section had the fewest women (4.8%), followed by the euphonium (10.8%), trombone (15.3%) and cornet (32.3%) sections. Brass bands typically listed between 18 and 24 members in total, and the numbers of women in individual brass bands varied widely. While four brass bands listed only one or two

Table 3. Gender Distribution by Type of Ensemble

	Women		Men		Non-binary		Total	
Instrument	*n*	%	*n*	%	*n*	%	*n*	%
Brass band	311	29.5	739	70.2	3	0.3	1053	100
Chamber orchestra	10	18.2	45	81.8	0	0	55	100
Opera and ballet orchestra	8	10.1	71	89.9	0	0	79	100
Symphony orchestra	13	8.0	149	92.0	0	0	162	100
Total	342	25.4	1004	74.4	3	0.2	1349	100

Table 4. Gender Distribution by Instrument – Brass Bands Only

	Women		Men		Non-binary		Total	
Instrument	*n*	%	*n*	%	*n*	%	*n*	%
Cornet	135	32.3	281	67.2	2	0.5	418	100
Flugelhorn	28	70	12	30	0	0	40	100
Tenor horn	71	56.3	55	43.7	0	0	126	100
Baritone	41	46.6	47	53.4	0	0	88	100
Euphonium	9	10.8	74	89.2	0	0	83	100
Trombone	20	15.3	111	84.7	0	0	131	100
Tuba	8	4.8	158	94.6	1	0.6	167	100
Total	312	29.6	738	70.1	3	0.3	1053	100

women, in several bands 40%–50% of members were women. Two of the brass bands had a majority of women members. In addition, the top 10 ranked bands had a smaller percentage of female members (21.8%) than those ranked below the top 10 (31.6%). In these top 10 bands, just 7.9% of the highly regarded corner seats of principal cornet, solo trombone and solo euphonium were occupied by women; indeed, the term *corner seat* is the gender-neutralised version of the more commonly used term *cornermen seat*.

Study 2

Method

Although Study 1 gives a clear picture of the gender ratio in professional and semi-professional ensembles, only a fraction of professional and semi-professional musicians in the UK play in such ensembles. It is far more common for musicians to have portfolio careers that include a variety of performance and education work, short-term contracts and freelance engagements (Umney & Kretsos, 2015). In Study 2, we asked if the gender ratios identified in orchestras and brass bands are reflected in the freelance workforce.

Freelance musicians are particularly hard to research, as they are not employed by any one organisation but undertake a variety of work at their own discretion. They may engage with a number of different organisations, but these organisations are not responsible for them in the same way that an employer would be. However, it is a professional expectation that musicians belong to one of the two industry bodies in the UK: the Musicians' Union (MU) or the Independent Society of Musicians (ISM).[3] Membership of the MU or ISM gives a freelance

musician certain legal protections, as well as public liability insurance and other general industry advice (Musicians Union, 2022; Incorporated Society of Musicians, 2022). Although not every brass musician belongs to one of these bodies, their membership records include a large number of freelance musicians. Brass players employed by an orchestra or other organisation are also likely to be members of the MU or ISM, so there will be some overlap with individuals already included in the data from Study 1. However, this is currently the best available source for data on freelance musicians.

For this study, a data request was sent by email to the membership offices of the MU and the ISM asking for the number of brass musicians who were currently members and the gender and instrument of each individual. It was assumed that this information would already be held by each organisation, and so it would be unnecessary to send out a new questionnaire to members. The data received were analysed to provide descriptive statistics for this sample of freelance musicians.

Results

Only one organisation provided data from their membership records, where each member's gender had been recorded using an item with four options: *female*, *male*, *non-binary* and *prefer not to say*. The question was optional, and four individuals chose not to select any of the four answers. None of the remaining individuals selected *non-binary* or *prefer not to say*. Members also seem to have described their main instrument in their own words, as a variety of similar terms are used. The researcher's professional knowledge was used to group responses into instrument families. For example, B flat trombone, tenor trombone, bass trombone and trombone were combined into one group labelled *trombone* so as to correspond with the groups used in Study 1. Twenty-five individuals described their main instrument simply as *brass* and were therefore omitted from the analysis of instrumental groups.

In total, these data represented 1,693 brass players, of whom 15.6% described themselves as female. When analysed by instrument this percentage varied widely, as shown in Table 5. There were greater percentages of women in the cornet (41.7%), French horn (31.6%), flugelhorn (28.6%) and euphonium (27.8%) categories, and all six individuals who played tenor horn and baritone were women. However, an imbalance was created by a large number of trumpet and trombone players, most of whom were men. The tuba was the instrument reported by the smallest percentage of women (8.6%).

Very few brass band musicians were listed as members of this organisation. In total, the instruments that are mainly found in a brass band (cornet, flugelhorn, tenor horn, baritone and euphonium) accounted for just 55 musicians out of the total group of 1,697. Of the trombone and tuba players, it is unknown how many musicians may play regularly or occasionally with brass bands. However, brass band musicians are required to class themselves as amateurs for competition registration and are therefore less likely to be a member of a professional body. It is also impossible to tell how many of these musicians engage with jazz or session work or who work in the theatre industry.

Study 3

Method

To bridge the gap between knowledge of school-level music-making and professional music-making, Study 3 collected data from youth ensembles that require a high standard of their players. While not all of these young musicians will go on to study music, many future professional musicians are drawn from this sector of music education. A previous study investigated children and young people engaged with UK music services, which operate within individual local authority areas (Hallam et al., 2020). To avoid replicating this dataset, the present study focused

Table 5. Gender Distribution in Freelance Musicians

	Women		Men		Total	
Instrument	*n*	%	*n*	%	*n*	%
Cornet	10	41.7	14	58.3	24	100
Trumpet	76	10.5	648	89.5	724	100
Flugelhorn	2	28.6	5	71.4	7	100
Tenor horn	4	100	0	0	4	100
French horn	106	31.6	229	68.4	335	100
Baritone	2	100	0	0	2	100
Euphonium	5	27.8	13	72.2	18	100
Trombone	49	10.4	424	89.6	473	100
Tuba	7	8.6	74	91.4	81	100
Brass	3	12	22	88	25	100
Total	264	15.6	1429	84.4	1693	100

Note: Four musicians did not select any option for the item on gender. No musicians identified as non-binary.

on ensembles that draw their members from a larger region or who operate nationally. It is assumed that members of these ensembles are playing at a higher standard than their peers, due to the competitive audition process required to join. A questionnaire was designed using JISC Online Surveys and sent electronically to the administrators of high-level youth ensembles in the UK. The list of ensembles was created using a pre-existing list of UK youth orchestras (Musical Chairs, 2021), from which 15 ensembles were selected based on their high audition standard and their regional or national significance. All ensemble members were admitted by a competitive audition process, and these auditions were open to young musicians of all genders. Participants were asked about the location and approximate standard of their ensembles and were invited to list the instrument and gender of each brass musician.

Results

In total, the administrators of nine of the 15 ensembles replied in full to the questionnaire, providing details of 224 young brass players. These nine ensembles consisted mostly of orchestral instruments, with only one ensemble listing a full complement of brass band instruments. The data for flugelhorn, tenor horn, baritone and euphonium therefore reflect only a very small group of musicians, ranging from 2 to 10 individuals. Because these numbers were so low, these instrument groups were not analysed individually.

Overall, 33% of brass players in youth ensembles were female (Table 6), and although a non-binary option was given in each case, no individual was listed as such. The French horn was the only instrument that could be described as gender-neutral, being played by approximately even percentages of girls (48.8%) and boys (51.2%). All the other instruments were predominantly played by boys, who accounted for 69.5% of trumpet players, 79.3% of trombone players, 77.3% of tuba players and 72.7% of cornet players. Some of the ensembles were more gender-balanced than others, and the overall percentage of girls hides a wide variety between the ensembles. In one ensemble, a higher percentage of girls than boys played brass instruments (62.5%), but three ensembles fell well below the average (0%; 9.1%; 16.7%). The percentages of girls playing brass instruments in the remaining five ensembles ranged from 28% to 38%.

Table 6. Gender Distribution in Youth Ensembles

	Girls		Boys		Total	
Instrument	*n*	%	*n*	%	*n*	%
Cornet	6	27.3	16	72.7	22	100
Trumpet	18	30.5	41	69.5	59	100
Flugelhorn	1	50	1	50	2	100
Tenor horn	4	66.7	2	33.3	6	100
French horn	20	48.8	21	51.2	41	100
Baritone	2	50	2	50	4	100
Euphonium	6	60	4	40	10	100
Trombone	12	20.7	46	79.3	58	100
Tuba	5	22.7	17	77.3	22	100
Total	74	33	150	67	224	100

Note: No musicians identified as non-binary.

Discussion

Size of instrument and musical context

As predicted by the existing literature, the findings of this research suggest a strong relationship between the size of a brass instrument and the number of women and girls reported as playing that instrument. A chi-square test showed a significant relationship between the size of the brass instrument (small, medium or large), and the number of women found to be playing that size of instrument ($\chi^2 = 113.46$, $p < .001$). Consistently across the three studies, the biggest brass instruments – the tuba, trombone and euphonium – were played by the smallest percentages of women and girls. Some of the smaller brass instruments, such as the cornet and tenor horn, were played by larger percentages of women, but this was not always the case. The trumpet is the smallest orchestral brass instrument, but far fewer women played trumpet than the French horn. Likewise, the baritone is only slightly smaller than the euphonium, and four times as many women were found to play the baritone as were found to play the euphonium. This suggests that, although the number of women playing each instrument may be partially influenced by its size, other factors are also likely to contribute to the association between the instrument and gender.

Some instruments are found in both brass bands and orchestras, and the numbers of women playing them varied by type of ensemble. For example, the trombone is played in both types of ensemble, but the percentage of female trombonists was higher in brass bands (15.3%) than in orchestras (7.7%). Similarly, a small percentage of tuba players in brass bands were female (4.8%) although there were no female tuba players in any orchestra. Gender ratios in brass playing are thus likely to be affected not only by the instrument played but also the type of ensemble in which it is played, to a greater extent than has previously been suggested in the literature.

The number of women in each brass band section may also be associated with the musical role of the instrument within the ensemble. The brass band instruments with supporting roles, such as the tenor horn and the baritone, were played by greater proportions of women than were found playing the lead instruments of cornet, trombone and euphonium. When combined for analysis, these three corner seats were occupied by a much lower proportion of women (13.9%) than in brass bands overall. The percentage of women in corner seats in the top 10 brass bands was even lower (7.9%), suggesting that the most prestigious brass band roles are least likely to be occupied by female players. These three positions take most of the stand-up solos in a typical concert programme, whereas the tenor horn and baritone are featured much less often (Newsome, 2006).

In the world of jazz improvisation, it has been shown that female instrumentalists are less likely to step forward and solo (Wehr-Flowers, 2006). This discrepancy may also be found in the world of brass bands, where it seems that women are more likely to play instruments with a musically supportive role than those with the more prestigious role of soloist.

Across the adult ensembles surveyed in Study 1, a greater percentage of women played in brass bands (29.6%) than played in professional orchestras (10.5%). This suggests that professional orchestras are less welcoming to women than semi-professional brass bands. It may be that professional status is more elusive for female brass players, but there are also some aspects of brass band culture that may make it more open to female brass players. In the UK, there is a strong sense of tradition and inheritance in brass banding (Gee, 2010). Several families have produced generations of outstanding brass band musicians, and the first women to perform in brass bands began by going to band rehearsals with their fathers or brothers (Russell, 2000). In addition, many brass bands have strong links to music education and are heavily involved with the coaching and encouragement of young brass players (Gee, 2010). These emphases on family connections, education and communal activity have links to prescriptive stereotypes for women (Koenig, 2018) and suggest that brass bands may present a more accessible context for women to play in.

If brass bands tend to be more welcoming than orchestras to women, so orchestras may tend to exclude them. Prestigious orchestras such as the London Symphony Orchestra explicitly banned female musicians until the 1970s (Morrison, 2003), so historically, their culture is not welcoming to women. Hiring processes involve a lengthy trial period during which the existing members determine the extent to which the candidate fits in with the instrumental section and ethos of the orchestra (Sergeant & Himonides, 2019). This could lead to the further exclusion of historically under-represented groups, including women in brass sections. Female brass players in the USA have reported hostile working environments when playing in male-dominated brass sections (Schmalenberger & Maddox, 2024), and there is nothing to suggest that this would be different in the UK.

Instruments associated with the feminine gender

Across the three studies, the flugelhorn was the only instrument strongly associated with the feminine gender (70%). The flugelhorn is predominantly a brass band instrument, similar in shape to the cornet. These two instruments have the same length of tubing and therefore the same range of notes, but the larger diameter of the pipe of the flugelhorn and the size of its bell (see Figure 1) produce a warmer and more mellow sound. It can be argued that this warmth and mellowness make the flugelhorn sound more lyrical, which is a characteristic often associated with more emotional and expressive music. In her feminist analysis of sonata form, Citron (1993) proposes that the second theme has historically been seen as feminine because it typically contains these lyrical qualities, in contrast with the first theme, which is typically more strident and energetic and therefore seen as masculine. This description could also be applied to typical musical writing for the flugelhorn and the cornet, explaining in part why so many more women play the former than the latter.

The availability of role models may also explain why more women than men play certain instruments. Girls may show more interest in playing masculine-typed instruments if they have visible female role models (Harrison & O'Neill, 2000), and the large number of women playing the flugelhorn today may be attributable to the visibility of a small number of female flugelhorn players in the past. One such player was a fictional character in the film *Brassed Off* (Herman, 1996), featuring the female flugelhorn player Gloria Mullens. Gloria is initially rejected from the local brass band because it will not admit female members but is later accepted on the basis of her family connection to the band and her exceptional talent. She is shown playing the flugelhorn in many scenes in the film, and this may have encouraged young girls and women to take up the instrument, as well as reducing negative feelings towards women brass players. It may be that

Figure 1. Flugelhorn (left) and cornet.

Brassed Off continues to exert an influence on the perceptions of audiences, as it is still regularly performed as a show with live accompaniment (The Octagon Bolton, 2024). If the flugelhorn, previously associated with masculinity (Newsome, 2006), can come to be associated with femininity, then it seems possible for all brass instruments to acquire a neutral gender association over time.

The leaky pipeline

Although brass band instruments were not well-represented in Studies 2 and 3, the orchestral instruments showed a decline in the number of women at every stage of career progression (Table 7). Women were numerically under-represented in most ensembles, but the situation in music education seems to be more equitable. In previous studies (Hallam, Rogers, & Creech, 2008, 2020), the French horn was found to be gender-neutral, and far more girls played the other orchestral brass instruments in youth ensembles than women did in adult ensembles or as freelance musicians. As awareness of gender biases increases, it may be that UK brass playing is also becoming more inclusive and will, over time, move towards equality of opportunity. However, the percentages of boys and girls playing brass instruments reported by Hallam et al. in 2008 and 2020 and the percentages reported in the present study are sufficiently similar to suggest that there has been no increase in the number of girls learning masculine-typed instruments in the past 14 years. If the brass-playing world were becoming more accessible to women, then a proportion at least of Hallam's 2008 participants would be expected to have moved into adult music-making, either in a brass band or as a professional orchestral player. However, these girls do not appear to have increased the numbers of women in professional orchestras at all and only slightly in semi-professional brass bands. If the brass-playing landscape were not changing significantly over time, then the attrition of women (the so-called leaky pipeline) may be attributable to obstacles that arise for female players in adulthood.

Table 7. Female Brass Players in Professional Orchestras, Freelance Work and Youth Ensembles

	Orchestras		Freelance		Youth ensembles	
Instrument	*n*	%	*n*	%	*n*	%
Trumpet	6	7.9	76	10.5	18	30.5
French horn	19	15.7	106	31.6	20	48.8
Trombone	6	7.7	49	10.4	12	20.7
Tuba	0	0	7	8.6	5	22.7
Total	31	10.5	238	15.6	55	33

Time commitment

Different types of ensemble require different commitments of time, and the most demanding ensembles in this study had the smallest percentages of women. Symphony orchestras in the UK often have a packed schedule of concerts, recordings and tours that involve national and international travel (Cotton, 2007). By comparison, chamber orchestras have a part-time schedule of concerts, undertake fewer tours and are likely to travel more locally. Even when differences in instrumentation were accounted for, these chamber orchestras contained more women; 18.2% of the members of chamber orchestras but only 8% of the members of symphony orchestras were women. Similarly, the percentage of women in the world's top 10 bands was lower (21.8%) than in lower-ranked bands (32%), and the difference in these types of ensembles is likely to reflect the difference in time commitment required of their members. Top-level brass bands take part in many contests with a view to winning and therefore demand more rehearsal and performance time. It could be that female brass players are less able to commit to top-level bands because of competing demands on their time. This reflects broader trends whereby women are more likely to be found in part-time work (Connolly & Gregory, 2009) and, on average, have fewer hours of leisure time than men (Office for National Statistics, 2018).

The data from freelance musicians in Study 2 suggest that freelance careers may be more achievable by or desirable to female brass players, perhaps also because of the time commitment involved. Although very few brass band musicians were included in Study 2, the percentages of women playing every orchestral instrument as freelance musicians were higher than the percentages of women playing that instrument as permanent orchestral musicians. This may be because it is difficult for women to find the time required for music performance, but it could also be because women want or need more flexibility in their working lives. Professional musicians often have to work during the evenings and at weekends. Musicians with caring responsibilities, who are most likely to be women (Carli, 2020), may need or want to work part-time or be able to set their own hours. This would explain why the percentage of freelance female musicians was higher than the percentage of female musicians in a permanent orchestra. As women are more likely to care for children and elderly relatives, they are more likely than men to take career breaks (Kuitto, Salonen, & Helmdag, 2019). Any work in the gig economy can be disadvantaged by interruption, but careers in music are particularly reliant on musicians' reputations and availability (Cottrell, 2004). Freelance musicians report significant anxiety relating to their perceived availability and willingness to abandon all other commitments for a gig (Scharff, 2017), and caring responsibilities would make this much more difficult for many women. Therefore a woman may be just as skilled as her male counterpart, but if she cannot be flexible and take work at short notice, then she may be passed over for opportunities and her career may be negatively affected.

Gender discrimination

There are many challenges for women working in masculine spaces within the music industry that may lead them to leave. A key factor for female musicians is the high prevalence of harassment in

the profession. A recent survey showed that 60% of respondents had experienced sexual harassment, and 77% of this group did not report the harassment. Levels of discrimination on the basis of gender and other protected characteristics were also reported to be high (Incorporated Society of Musicians, 2018a). It was suggested that the precarious nature of most musical work leads to low levels of reporting, and conductors and section principals, who are more likely to be male, hold a great deal of power over the distribution of work in brass sections. A more recent report from the UK government's Women and Equalities Committee (2024) published a series of recommendations to address the serious, ongoing difficulties that women face in the music industry. The committee called on conservatoires and industry bodies to do more to address the misogyny and discrimination that they found to be commonplace across the UK music industry. These surveys did not offer any breakdown of discrimination by instrumental group or musical genre, but it has been shown elsewhere that gender discrimination is more prevalent in industries that are historically male (Rosenberg, Perlstadt, & Phillips, 1993; Lafontaine & Tredeau, 1986). Possible reasons for this include historical expectations for women, a lack of reporting procedures and a lack of informal support networks. A recent exposé in *New York Magazine* (Sussman, 2024) suggested that multiple allegations of sexual assault and other inappropriate behaviour in the brass section of the New York Philharmonic had been swept under the carpet by the orchestra and the union. The result of these incidents and the processes that followed was that only two women brass players were forced out of the orchestra, and the men accused of misconduct remained in their posts. This aligns with the results from a survey of American brass players (Schmalenberger & Maddox, 2019) in which several participants cited harassment as their reason for leaving the music industry, and it is possible that this is also a factor in the UK.

As well as explicit gender discrimination and sexual harassment, internalised biases and stereotypes may also hinder the progression of women brass players. Playing a brass instrument directly contradicts the feminine stereotypes that suggest women should be gentle and supportive (Eagly & Karau, 2002) and women may experience a backlash for playing instruments that are prominent and individualistic. The brass band sections that were populated by women also tend towards musically supportive rather than soloistic roles. Instruments such as the tenor horn (56.3% women) and baritone (46.6% women) play a musically supportive role, and therefore, women playing these instruments may experience less backlash than their colleagues. Counteracting stereotypes in daily life has been shown to have a negative impact on the individuals concerned and has been linked to increased levels of anxiety and low self-esteem (Guerrero-Witt & Wood, 2010). The musical profession is one in which female musicians report significantly higher levels of performance anxiety (Liston, Frost, & Mohr, 2003), and this additional source of anxiety for female brass players may have a significant impact on their ability to create and maintain successful careers. Stereotype threat, which can reduce confidence and impair performance for members of a minoritised social group, also affects women undertaking masculine-typed tasks (Spencer, Logel, & Davies, 2016). Since the music industry is so competitive, and prestigious seats are awarded on the basis of relatively small differences in performance, this is likely to have a serious effect on the success of female brass players.

Some organisations in the UK have introduced measures to minimise the risk of stereotype threat and gender bias. Screened auditions, which have been shown to increase the number of women playing in US orchestras (Goldin & Rouse, 2000), are used by some UK orchestras but often for the first round only (Musical Chairs, 2022). It would be impossible to use screens in the trial system adopted by UK orchestras, so this would have limited use as an intervention.[4] For musicians, opportunities for performance come either formally from an ensemble manager or informally from colleagues working in the same field. In either situation, unconscious bias may form part of the decision-making process and may lead to equally competent female brass players being passed over in favour of men. It has been suggested by several female brass players that they have to be better than their male colleagues in order to develop similar careers (Gee, 2010), and this seems to create an extra layer of precarity to the musical profession for female brass players.

Limitations

This research has identified gender ratios in many different types of UK ensembles in which brass instruments are played and has suggested possible explanations for them. However, it cannot be said to provide a complete picture of gender ratios in UK brass playing. In particular, the findings of Study 2 are based on data from only one of the two main professional bodies for musicians in the UK. This leaves a large number of freelance musicians unaccounted for, as well as those few who may not belong to a professional body. However, given the large number of brass musicians represented in Studies 1 and 2, it is likely that the findings are robust.

The main advantage of the method used in Study 1 is that a large body of data was available to the researchers, who did not have to rely on participants' responses. However, working with information in the public domain also has disadvantages. The researchers had no means of checking the factual accuracy of the information or ensuring that it was completely up to date. The data were collected a year into the COVID-19 pandemic when the activities of most ensembles were severely limited; there might have been fewer vacancies in the ensembles had data been collected at another time.

Although comparisons were made across all three studies for the orchestral instruments, this was not possible for brass band instruments. It had been predicted that most brass band musicians would not be members of a professional organisation since they need to prove their amateur status for contest registration purposes. The low numbers of brass band musicians represented in Study 3 made it impossible to compare high-level youth bands with adult bands. However, data from 2020 were already available for young musicians learning brass band instruments via UK music services, so the ratios reported are likely to be as applicable to brass band instruments as to orchestral instruments. Finally, it is unlikely that the research captured the experiences of people who identify as non-binary. Data from the 2021 UK Census estimates that 0.5% of the population have a gender identity that differs from their sex assigned at birth (Office for National Statistics, 2023). In the present study, only three individuals were not identified as either women or men, representing a far smaller sub-group of the sample and too small for any meaningful conclusions to be drawn.

Future research

Research relating to under-represented groups often risks making generalisations about the characteristics of the members of that minoritised group. Women are sometimes treated as one homogenous group for the purposes of beginning to create a body of research, but a more nuanced approach would have more benefits. A logical follow-up to this study would be to explore the experiences of individual female brass players by using qualitative interviews to gather in-depth data. It could also be fruitful to explore the UK brass-playing culture in more detail by asking brass players, generally, about their careers and the contexts in which they play. The findings of such a follow-up study could explain why girls and young women are being put off brass playing, reducing the numbers of women in the profession. Given the potential impact of intersections between race, class, sexuality and/or age on women's representation in brass playing, we would also be able to address the question of intersectionality, which has not been covered in the present study. Questions relating to parental leave policies and time pressures for women musicians might also provide more context for the leaky pipeline found for women in brass playing.

Conclusion

As can be seen from the results of the three studies, it is an oversimplification to say that all brass instruments are strongly associated with the masculine gender. Some instruments, such as the tenor horn and the baritone, tend to be considered gender-neutral, while adult musicians clearly

associate the flugelhorn with the feminine gender. This suggests that the historical idea of masculinity associated with brass instruments has evolved in some cases but not in others. These results also show that female brass players have a greater tendency to leave the brass-playing community as the ensemble's level of expertise increases. This might explain why there is still a distinct lack of women in the most prestigious ensembles and positions. There are key gaps in female representation, particularly in orchestral brass sections and in the playing of larger brass instruments. The visibility of instrument-specific role models may increase the number of women who play particular instruments, but more research is needed to explore the influence of role models.

Since gender associations are less rigid in young musicians, it seems that targeted interventions would be most effective for girls and young women. Support for girls as they consider their musical futures and women as they tackle gender-related obstacles in their musical journeys, professional or otherwise, may also help to increase retention and progression. This is crucial in ensuring that women and girls are able to reach their full musical potential in any way they choose and to benefit from the personal fulfilment that a life in brass playing can bring.

Notes

1 In Britain, a brass band is an ensemble with a set formation of brass and percussion instruments. It includes the saxhorn family of instruments (flugelhorn, tenor horn, baritone horn, euphonium and bass or tuba), cornets and trombones, but not trumpets or French horns (Miller, 2022).

2 In the UK, a music service is 'an organisation which provides instrumental, vocal and curriculum teaching and ensemble provision', usually attached to a local authority (Stafford, 2023).

3 On 7 October 2022, the ISM changed its name from the Incorporated Society of Musicians (https://www.ism.org/about).

4 In UK orchestras, potential members are typically invited to play with the orchestra on a temporary basis to ensure that they will be a good fit for the section both musically and socially (Gee, 2010). This is not the case in other countries, such as Germany or the USA (Goldin & Rouse, 2000).

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