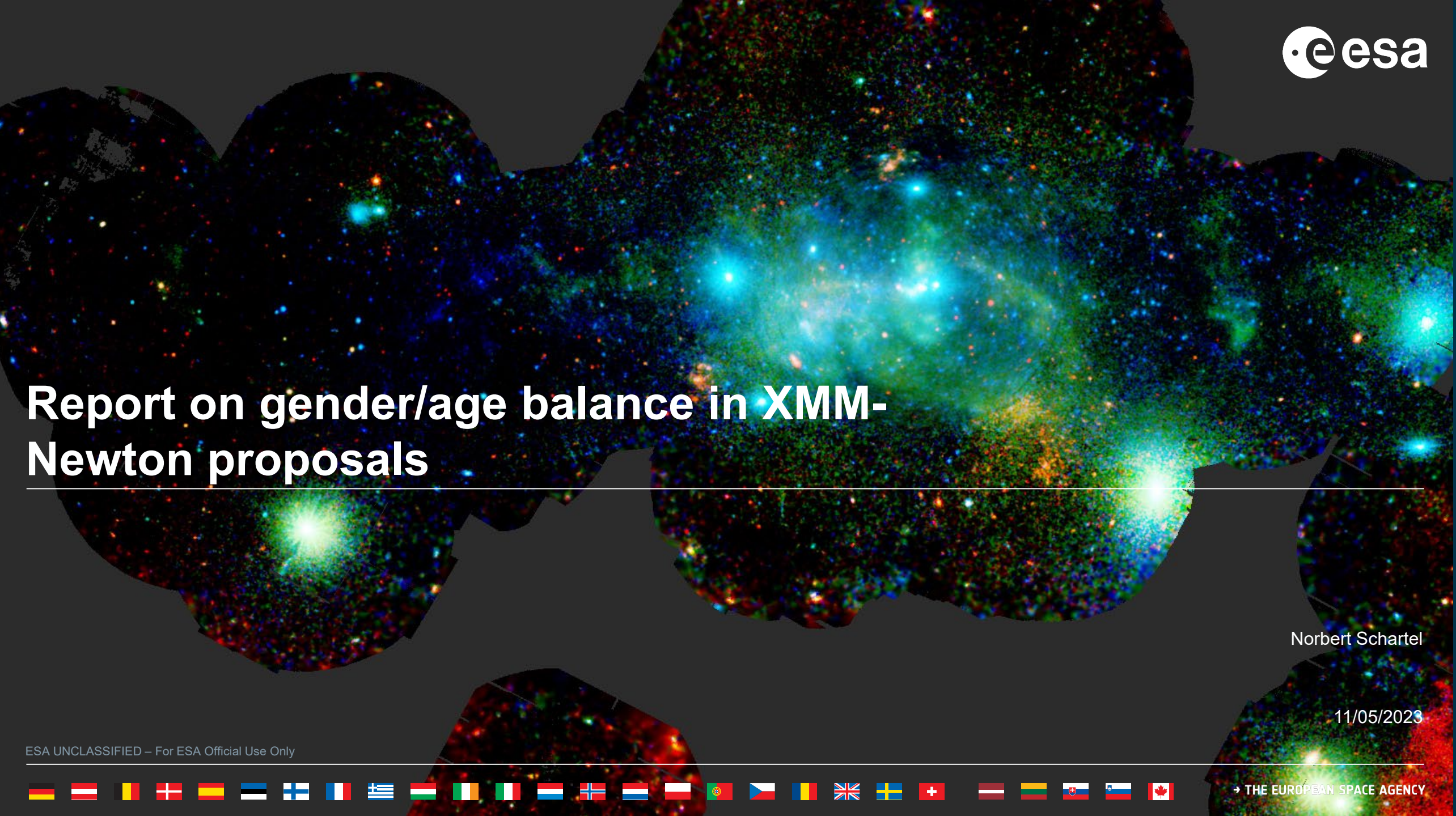

Report on gender/age balance in XMM-Newton proposals

Norbert Schartel

11/05/2023

Some Background:

- AO1 (1999) Classical set-up:
  - One panel per scientific category (7 scientific categories)
  - Between 5 and 9 panel members
  - All conflicts in the panel ("solved" by conflicted panel member leaves the room)
  - Special: Panel meetings on different dates (due to manpower constraints)
  - Special: Panel members from almost all member states of ESA (← D/SCI)
- → Review experience: brightest light and darkest shadows → change of set-up
- AO2 15 panels most with 3 panel members only → change of current set-up
- Later input from personal experiences
  - Chandra & NuSTAR
  - Chairpersons meeting (large program discussion)
  - ESO from comments
- → Adjustments of set-up

Lessons from AO1 / Set-up

- Lessons from AO1/AO2:
  - A panel should not evaluate proposals of members of the panel (most important of PI, CoI)
  - Panel members may be biased by the fact that a PI or CoI of the proposals is a member of any other panel
  - To ensure that a discussion focus on the science it is important that the panel members come from different communities and networks
  - Any ratings and decisions of a panel should not impact the evaluation of proposals submitted by panel members
- Set-up:
  - 2 or more panels per scientific category
  - Each panel consists of 5 panel members from different countries of home institutes
  - Each panel meets on different dates & places
  - The Panel members do not know the members of the other panels
  - Each panel has a defined and fixed budget of observing time which it allocates
  - Chairpersons are not allowed to be PI of large programs

XMM-Newton Observing Time Proposals

ESA Science Programme Missions: Contributions and Exploitation

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John Zarnecki
The Open University, Milton Keynes, UK

the date of receipt and acceptance should be inserted later

Publication in preparation
It will be open access

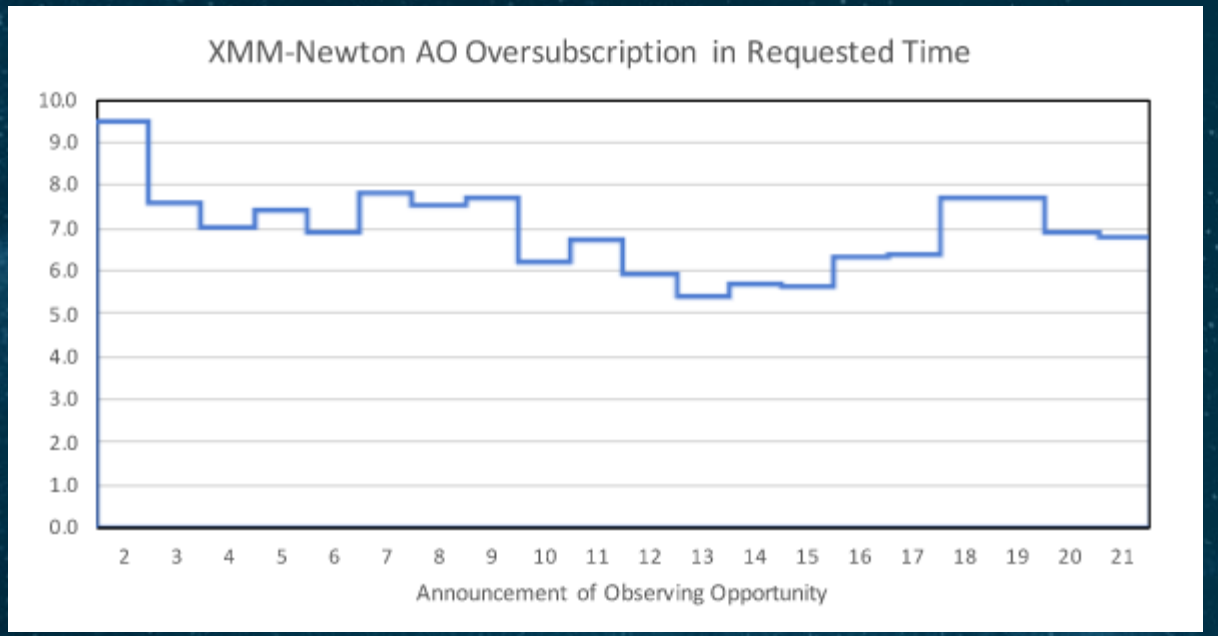
XMM-Newton Observing Time Proposals

A. N. Parmar[1], N. Schartel[2] and M. Santos-Lleó[3]

Introduction

XMM-Newton was launched on 10 December 1999 into a 48-hour highly elliptical orbit. The mission provides sensitive X-ray imaging and spectroscopic observations of a wide variety of cosmic sources from nearby

XMM-Newton Observing Time Proposals



XMM-Newton Observing Time Proposals

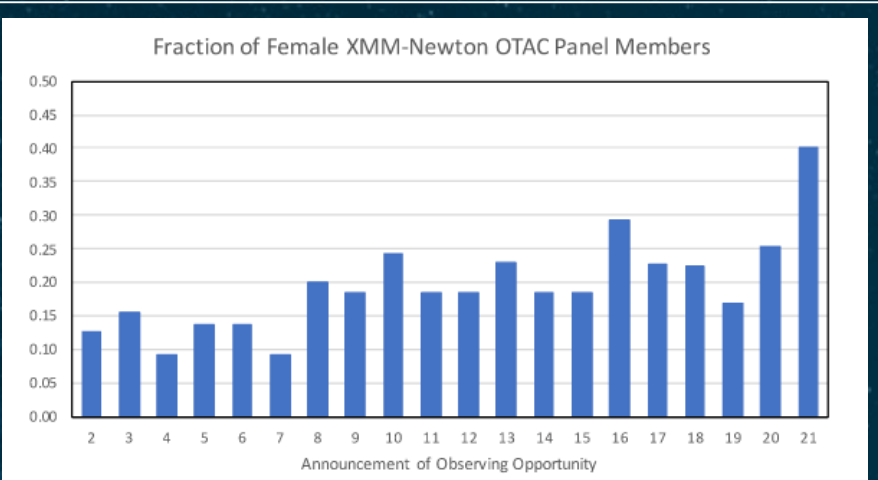


Fig. 32 The fraction of female XMM-Newton OTAC members compared to the total for AO-2 to AO-21 covering an interval of around 20 years. A steady increase in the fraction of females from ~0.15 to ~0.30 by AO-20 is evident with a sharp increase in AO-21.

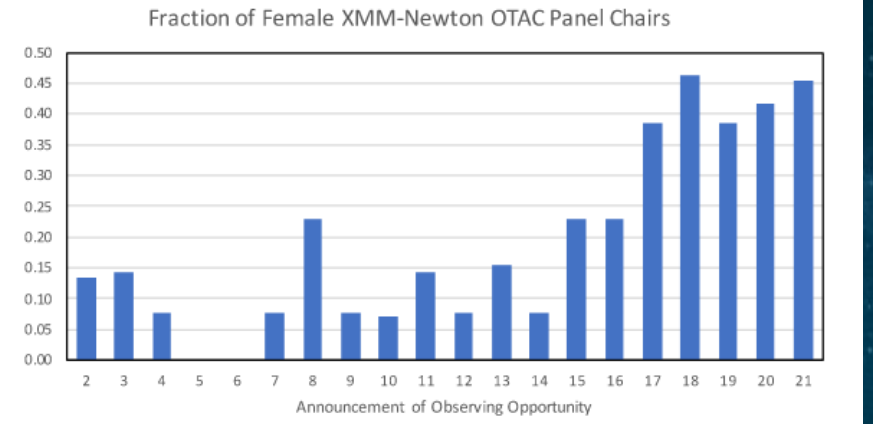


Fig. 33 The fraction of female XMM-Newton OTAC chairs compared to the total for AO-2 to AO-21 covering an interval of around 20 years. An increase in the fraction of females from ~0.10 to ~0.45 by AO-21.

XMM-Newton Observing Time Proposals

Table 18 The number of proposals submitted and accepted from PIs located in a range of countries. In this case "accepted" means awarded any observing time.

Country	No. Proposals Submitted	Percentage of Total	No. Accepted	Acceptance Percentage
AUSTRIA	26	0.25	6	23.1
BELGIUM	150	1.42	57	38.0
CZECH REPUBLIC	15	0.14	5	33.3
DENMARK	9	0.09	5	55.6
ESTONIA	4	0.04	0	0.0
FINLAND	49	0.46	16	32.7
FRANCE	394	3.72	189	48.0
GERMANY	1258	11.89	535	42.5
GREECE	40	0.38	12	30.0
HUNGARY	6	0.06	0	0.0
IRELAND	32	0.30	6	18.8
ITALY	1215	11.49	538	44.3
LUXEMBOURG	0	0.00	0	0.0
NETHERLANDS	361	3.41	185	51.2
NORWAY	1	0.01	1	100.0
POLAND	34	0.32	12	35.3
PORTUGAL	4	0.04	1	25.0
SPAIN	598	5.65	238	39.8
SWEDEN	17	0.16	6	35.3
SWITZERLAND	115	1.09	50	43.5
UNITED KINGDOM	941	8.89	406	43.1
ARGENTINA	14	0.13	5	35.7
AUSTRALIA	43	0.41	17	39.5
BRAZIL	18	0.17	10	55.6
BULGARIA	13	0.12	6	46.2
CANADA	161	1.52	65	40.4
CHILE	35	0.33	12	34.3
CHINA	116	1.10	31	26.7
INDIA	83	0.78	20	24.1
ISRAEL	28	0.26	12	42.9
JAPAN	304	2.87	90	29.6
KOREA	20	0.19	5	25.0
MEXICO	35	0.33	9	25.7
RUSSIA	28	0.26	9	32.1
TAIWAN	46	0.43	10	21.7
TURKEY	29	0.27	10	34.5
UNITED STATES	4306	40.70	1699	39.5

XMM-Newton Observing Time Proposals

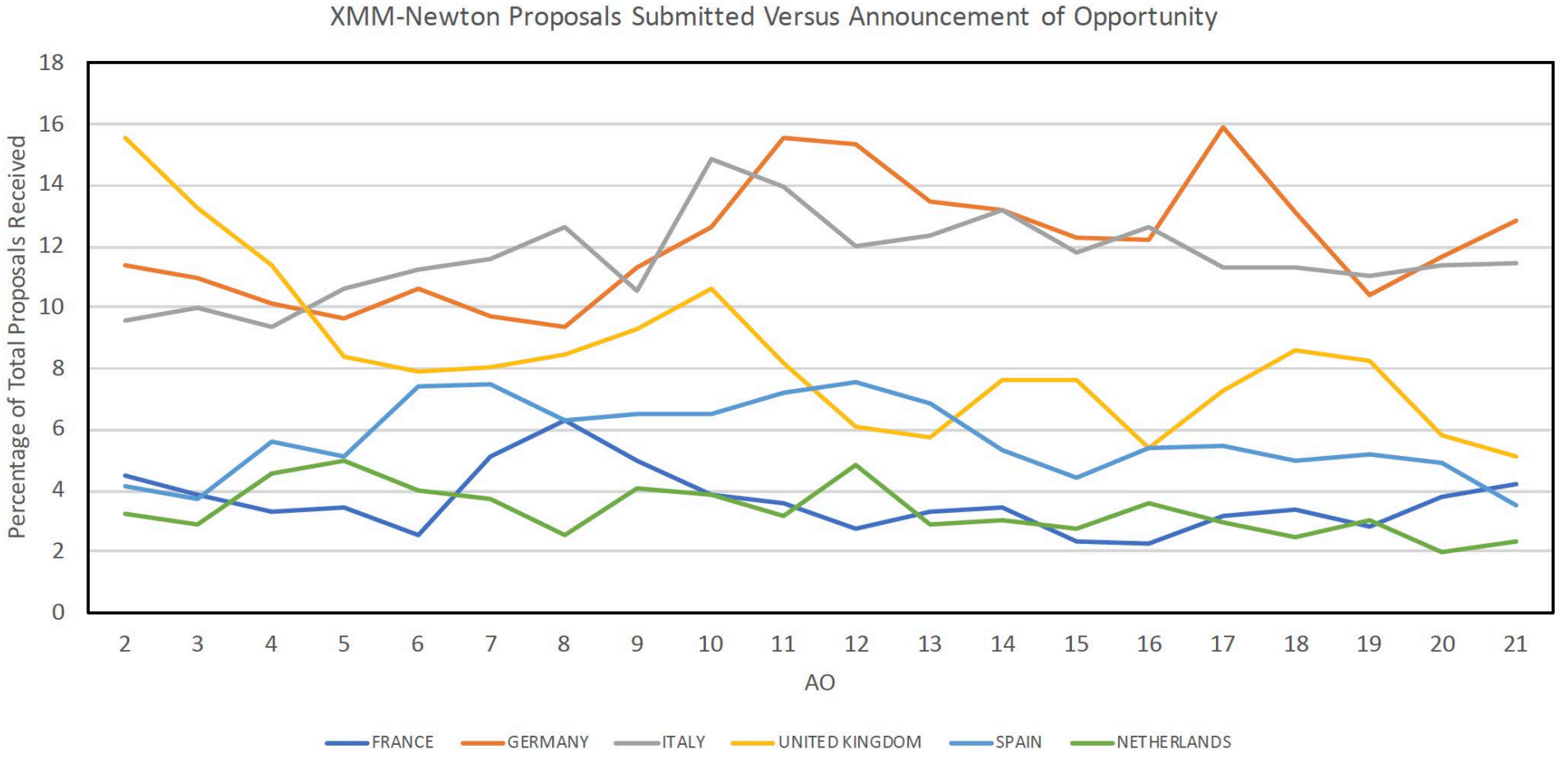


Fig. 36 Proposals submitted from the six ESA Member States with the largest numbers of proposals against AO number.

XMM-Newton Observing Time Proposals

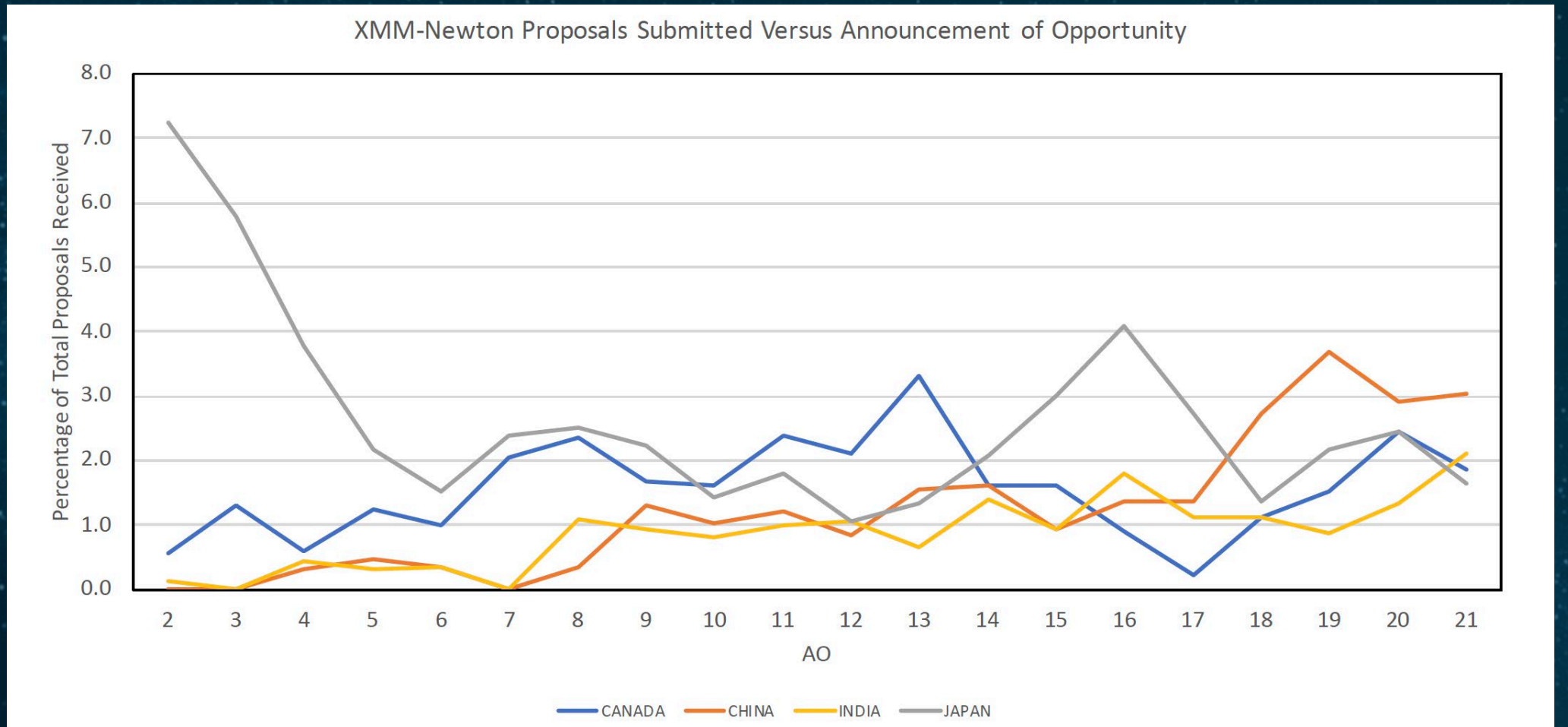


Fig. 37 Proposals submitted from the Non-Member States with the largest numbers of proposals against AO number (excluding the USA).

XMM-Newton Observing Time Proposals

Table 19 The number of proposals submitted and accepted from male and female PIs located in countries with >100 proposals in total. The differences are with respect to the acceptance percentages given in Table 18 which are for all proposals.

Country	Proposals Submitted		% Female	Proposals Accepted		% Difference	
	Male PI	Fem. PI	/Total	Male PI	Fem. PI	Male PI	Fem. PI
BELGIUM	86	64	42.7	35	22	2.7	−3.6
FRANCE	258	136	34.5	141	48	6.7	−12.7
GERMANY	945	313	24.9	413	122	1.2	−3.6
ITALY	843	372	30.6	389	149	1.9	−4.2
NETHERLANDS	267	94	26.0	130	55	−2.6	7.3
SPAIN	431	167	27.9	175	63	0.8	−2.1
SWITZERLAND	96	19	16.5	45	5	3.4	−17.2
UNITED KINGDOM	752	189	20.1	322	84	−0.3	1.3
CANADA	80	81	50.3	33	32	0.9	−0.9
CHINA	105	11	9.5	31	0	2.8	−26.7
JAPAN	234	70	23.0	66	24	−1.4	4.7
UNITED STATES	3400	906	21.0	1374	325	1.0	−3.6

XMM-Newton Observing Time Proposals

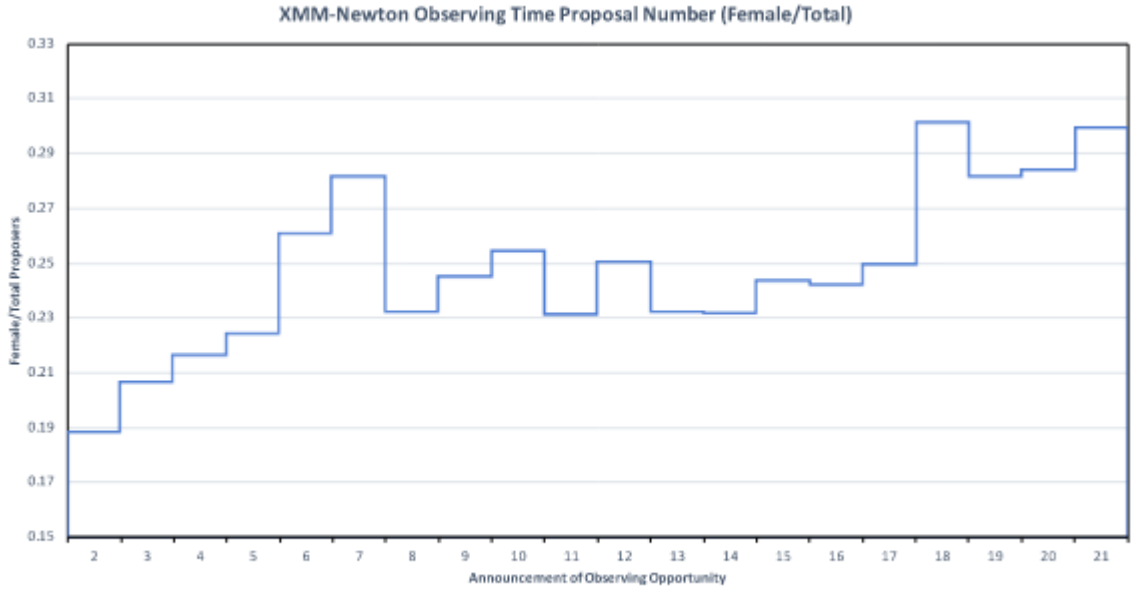


Fig. 36 The fraction of submitted proposals with a female PI compared to the total.

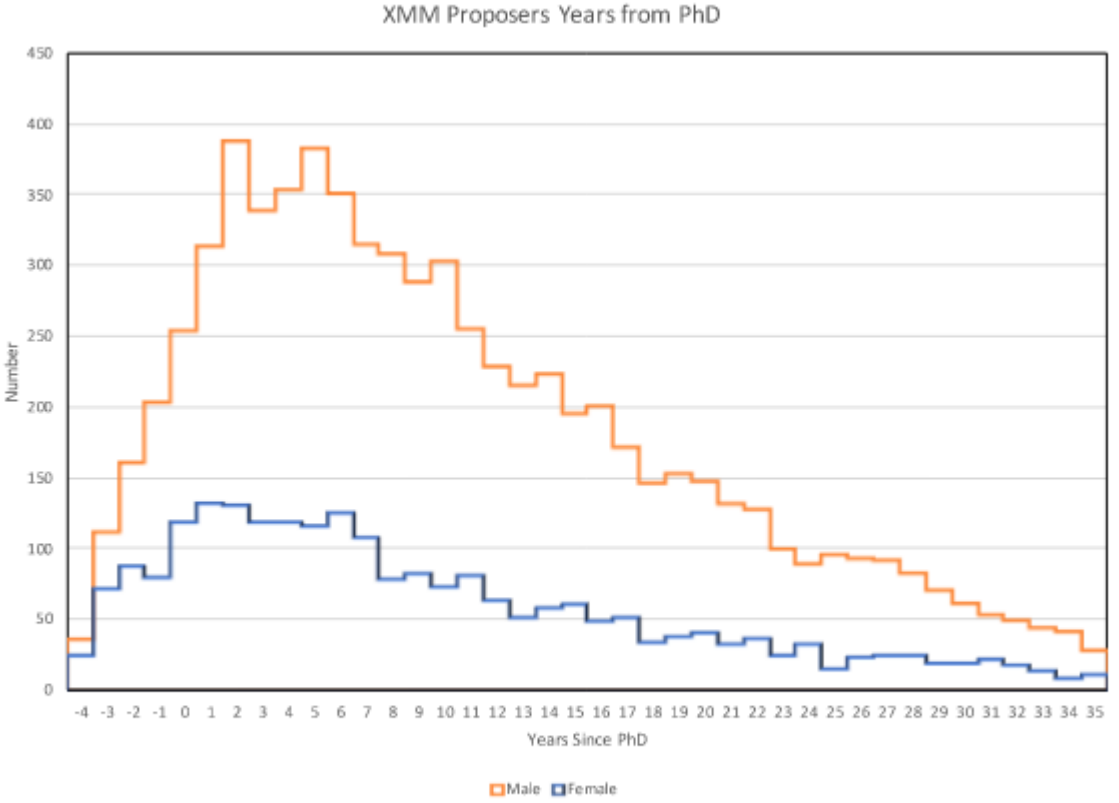


Fig. 37 The age distribution (years since PhD) for male and female XMM-Newton PIs. The median age of female PIs is 7.2 years, compared to 9.1 years for male PIs.

XMM-Newton Observing Time Proposals

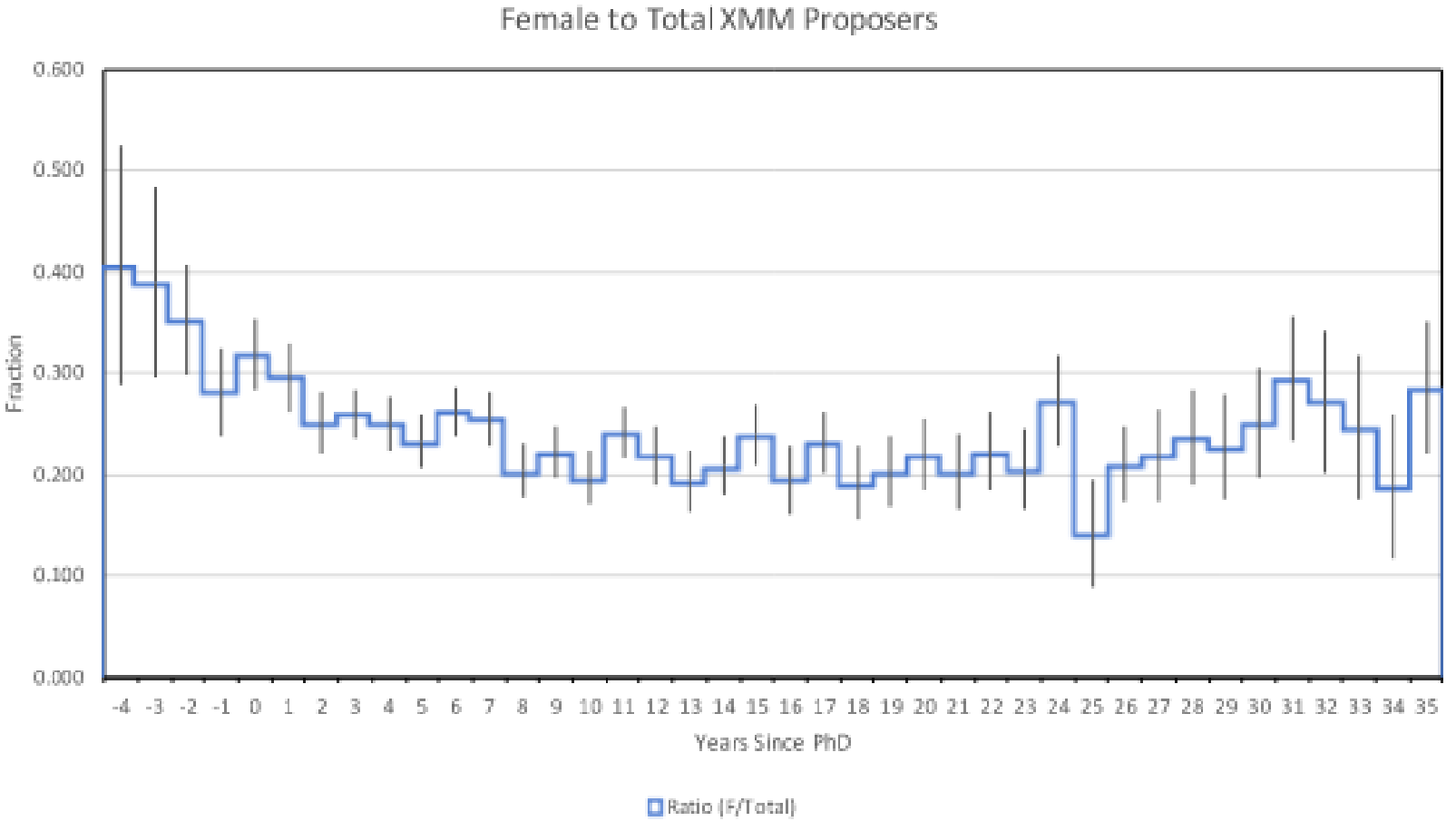


Fig. 38 The ratio of the age (years since PhD) of female compared to all XMM-Newton PIs showing the increase in "young" (less than around 5 years from obtaining a PhD) female PIs compared to the total.

XMM-Newton Observing Time Proposals

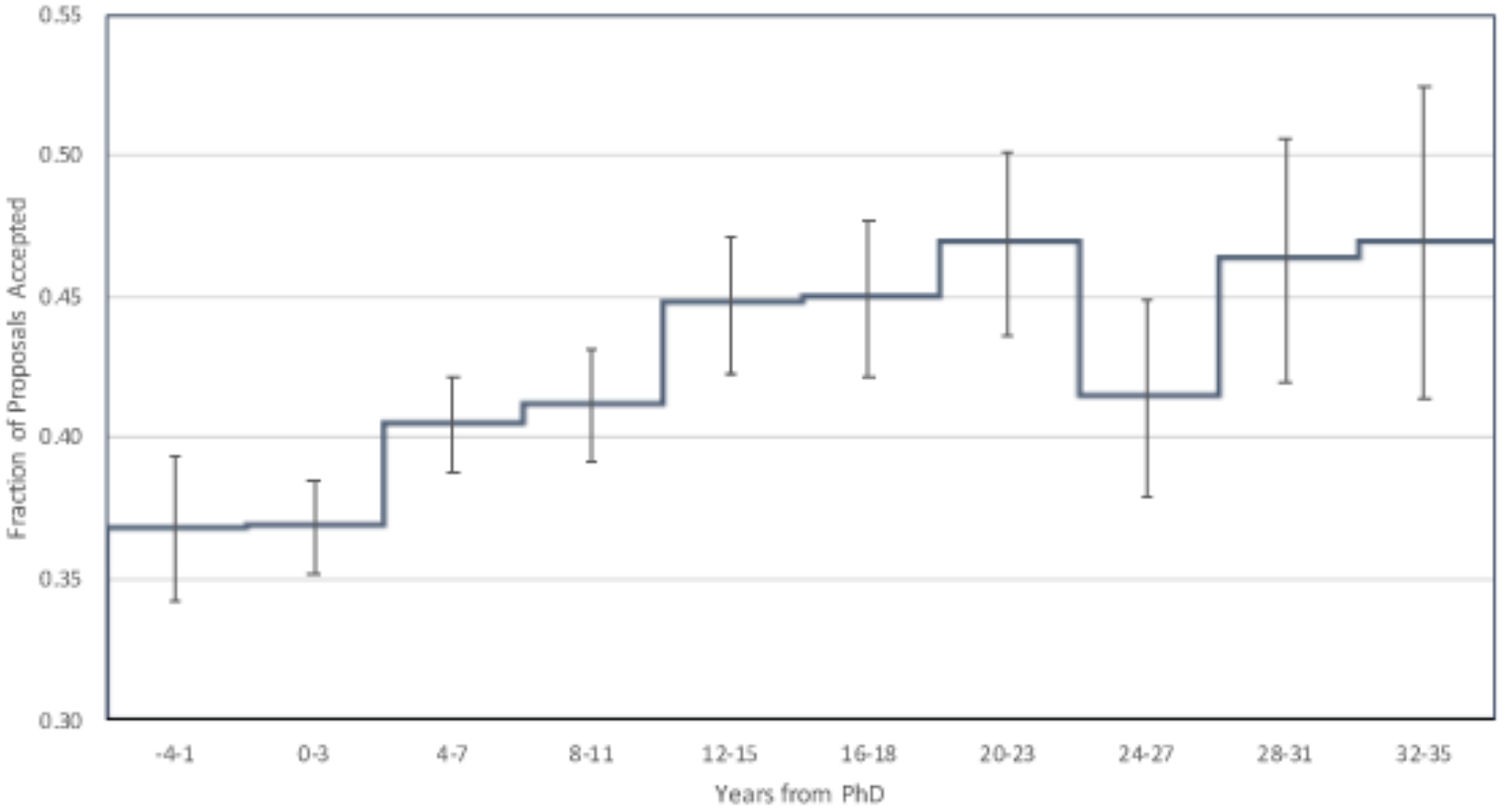


Fig. 39 The acceptance fraction of all XMM-Newton PIs with year of their PhD. The error bars indicate the 1σ standard deviations assuming that the proposal statistics follow a Poisson distribution.

XMM-Newton Observing Time Proposals

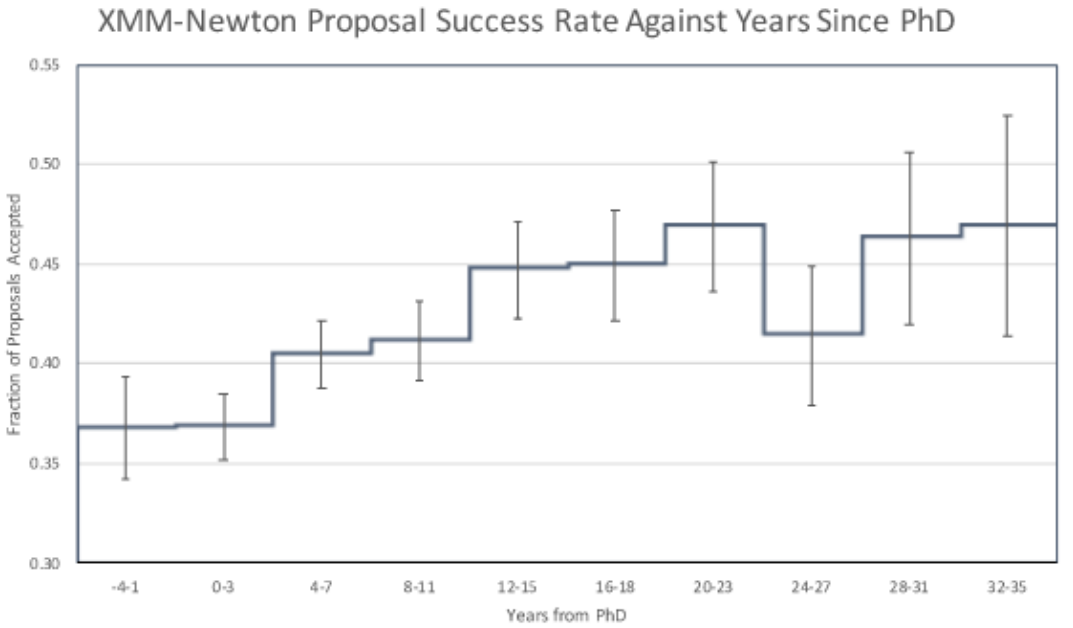
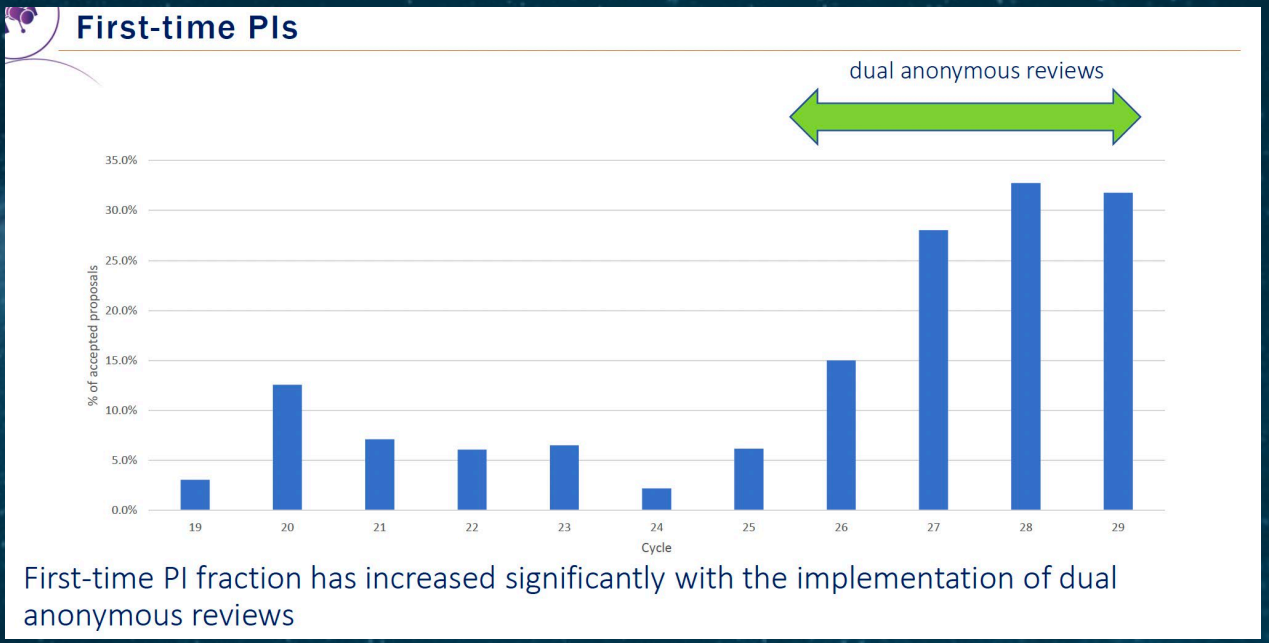


Fig. 39 The acceptance fraction of all XMM-Newton PIs with year of their PhD. The error bars indicate the 1σ standard deviations assuming that the proposal statistics follow a Poisson distribution.



First-time PI fraction has increased significantly with the implementation of dual anonymous reviews

XMM-Newton Observing Time Proposals

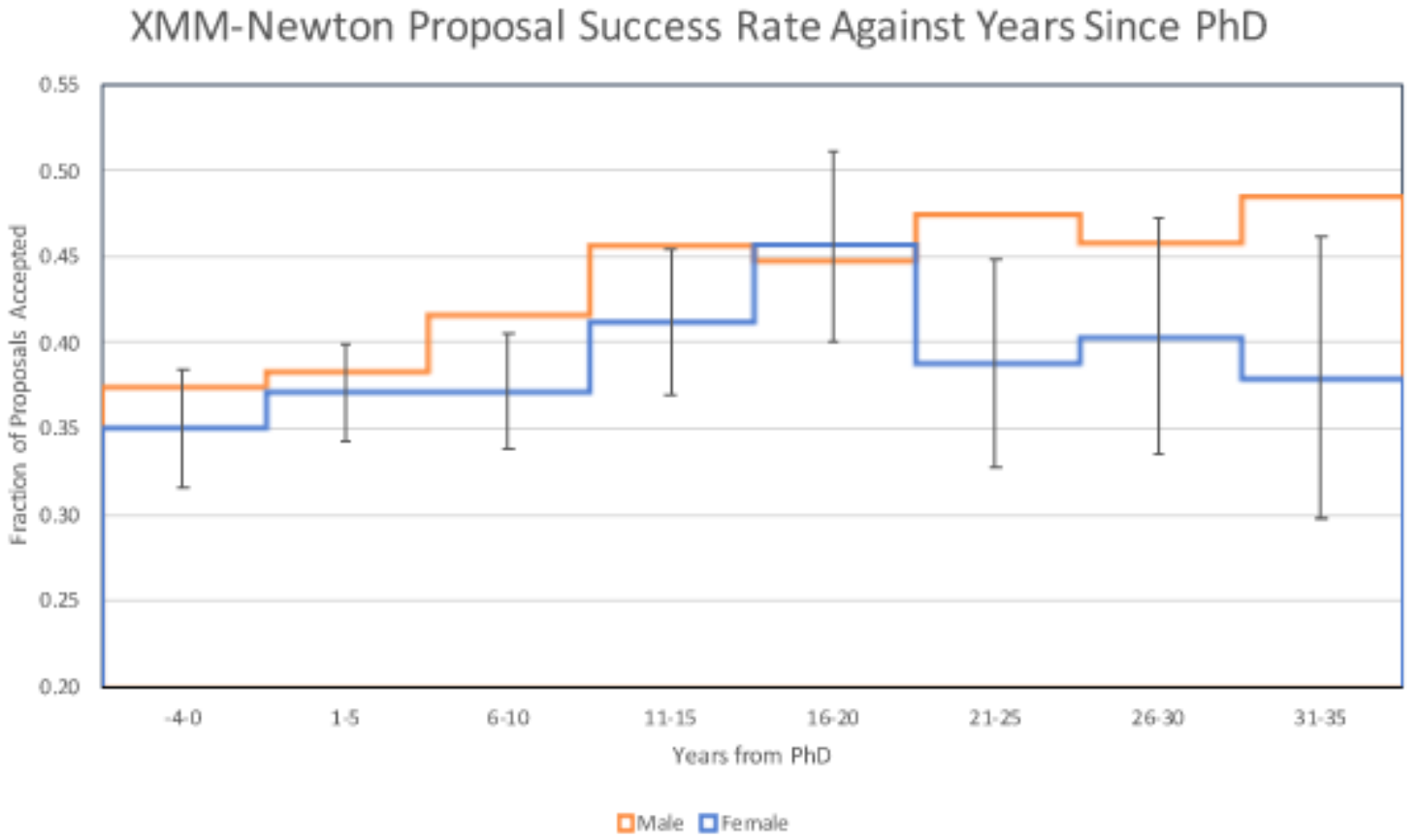


Fig. 40 The acceptance fractions of male and female XMM-Newton PIs with year of their PhD. The success rate of male PIs shows a gradual increase with PhD age from around 0.38 to nearly 0.50 in the age range considered. For female PIs the success rate appears to increase in a similar manner to their male colleagues until ~20 years after PhD, after which the increase appears to stop and may even reverse.

XMM-Newton Observing Time Proposals

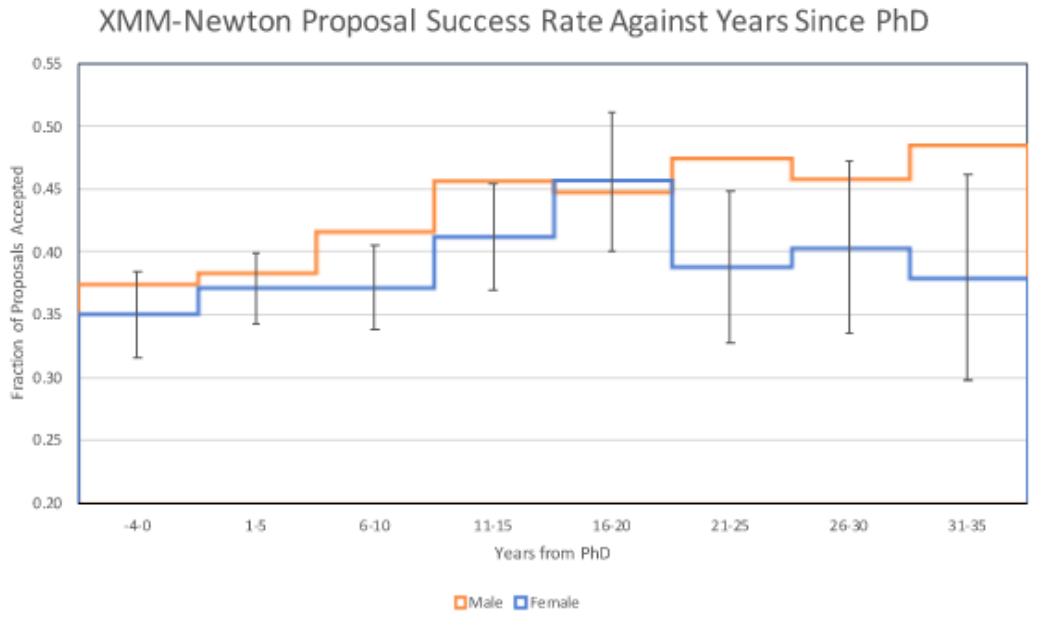


Fig. 40 The acceptance fractions of male and female XMM-Newton PIs with year of their PhD. The success rate of male PIs shows a gradual increase with PhD age from around 0.38 to nearly 0.50 in the age range considered. For female PIs the success rate appears to increase in a similar manner to their male colleagues until ~20 years after PhD, after which the increase appears to stop and may even reverse.

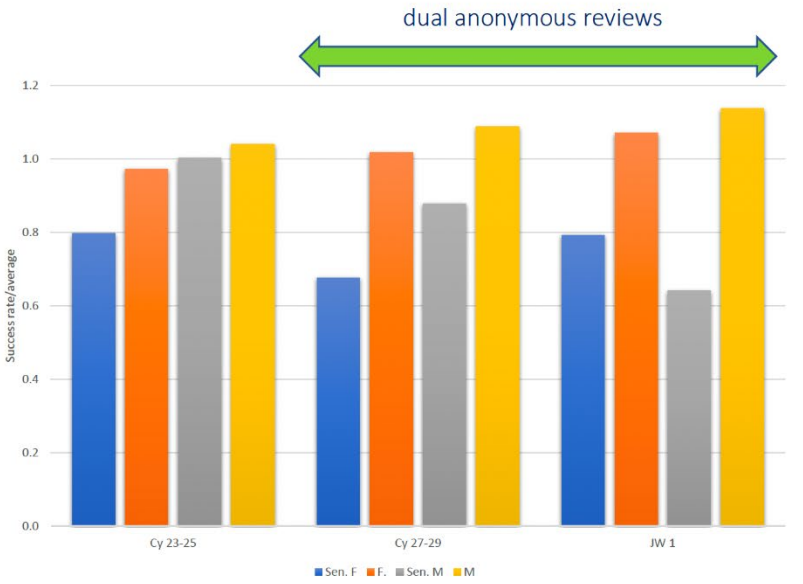
6

Proposal success rate with seniority

Success rates of proposals led by

- Female PIs, Phd pre-2000
- Female PIs, Phd 2000+
- Male PIs, Phd pre-2000
- Male PIs, Phd 2000+
- Normalised against the average success rate

The fraction of successful proposals led by more senior male and female PIs has decreased with the move to dual anonymous.



XMM-Newton Observing Time Proposals

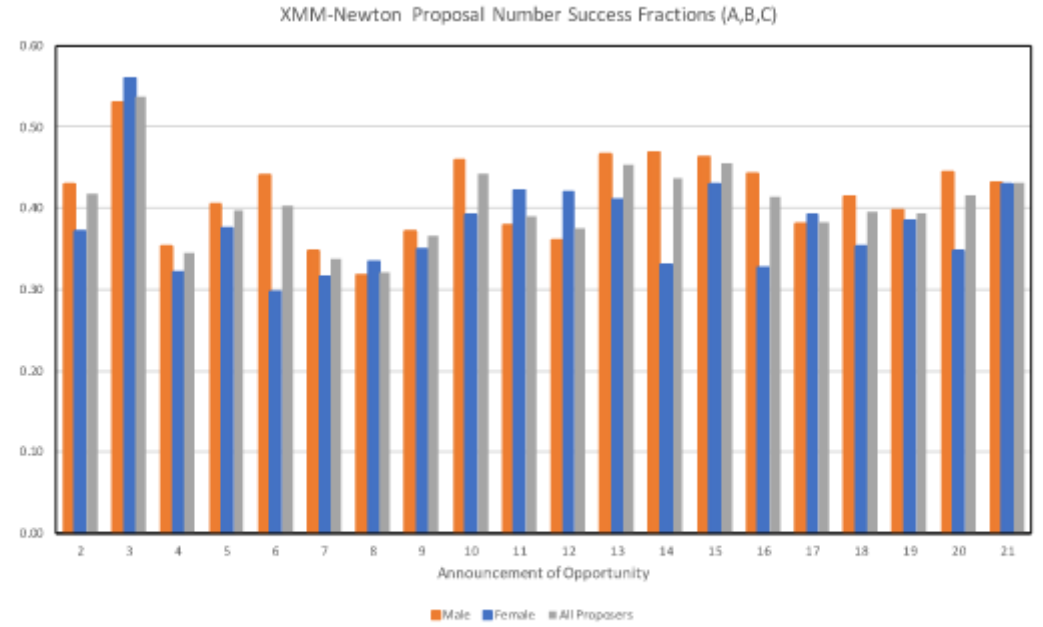


Fig. 41 The fraction of accepted (Priority A, B or C) proposals compared to the number submitted. The histograms show the acceptance fractions for male PIs, female PIs and all PIs.

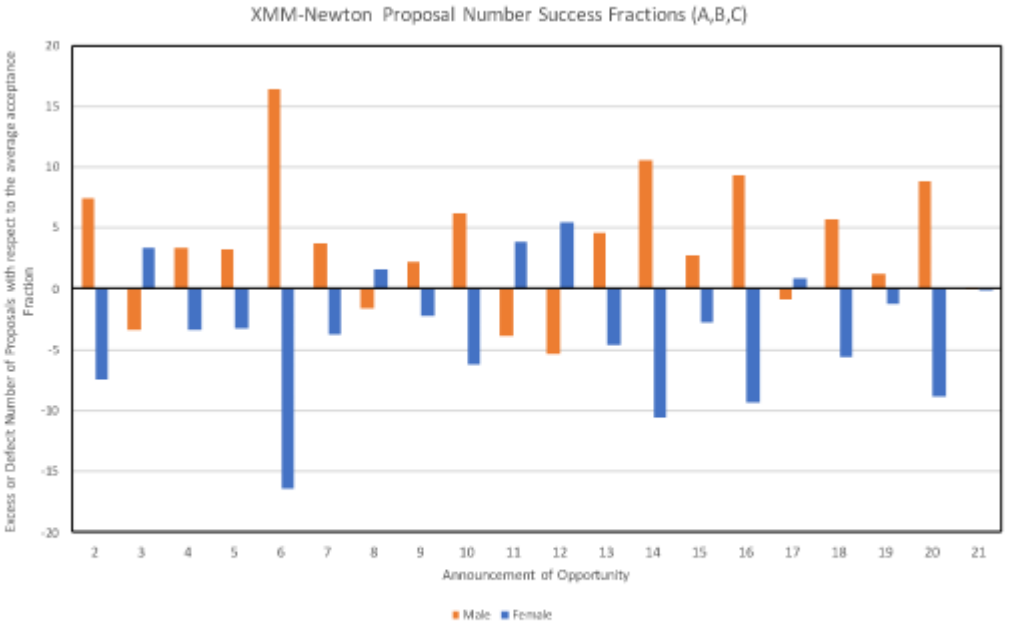


Fig. 42 The relative success rates of XMM-Newton proposals.The histograms show the difference between the actual number of successful proposals and the expected number based on the overall acceptance rate.

XMM-Newton Observing Time Proposals

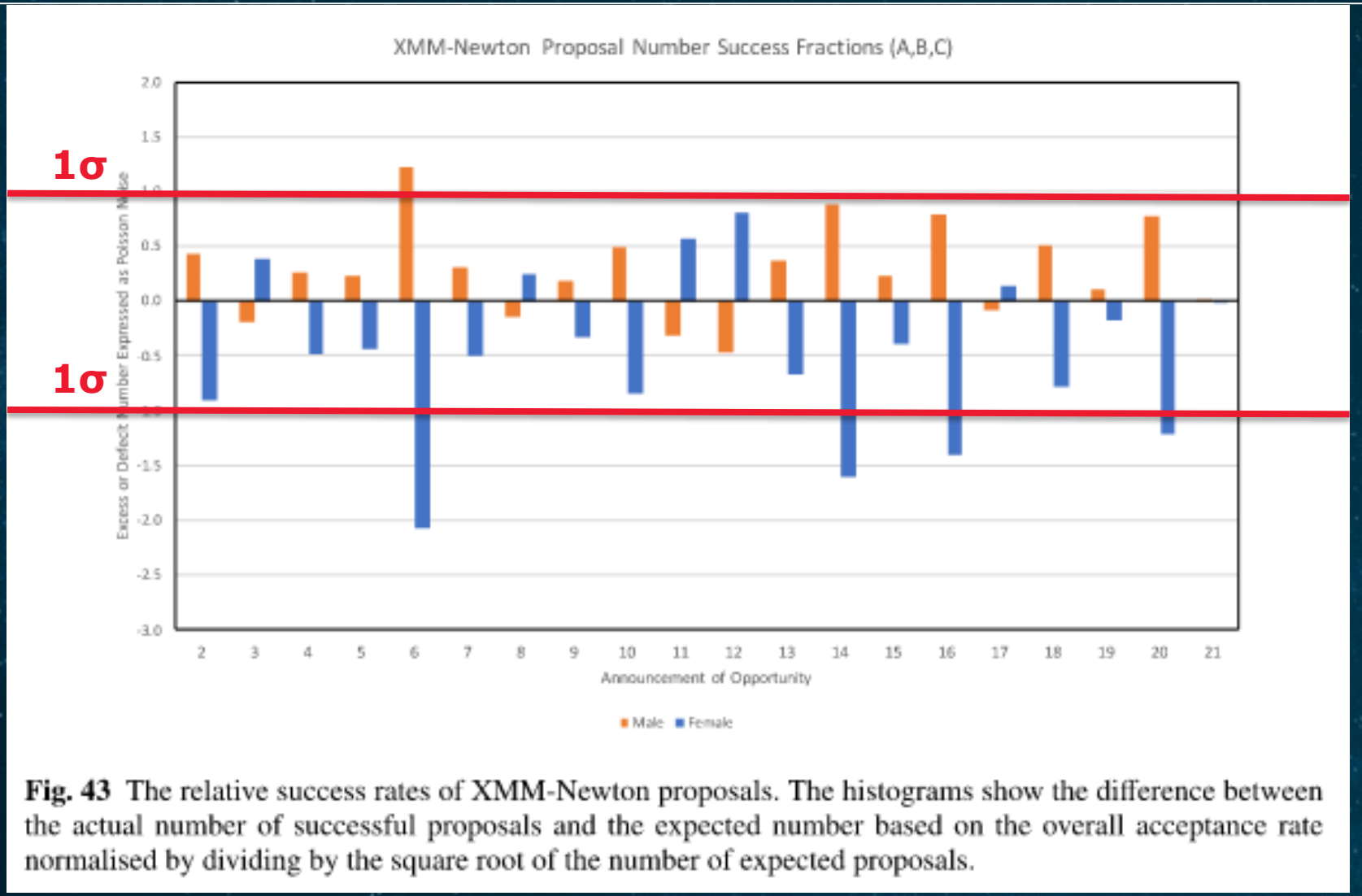
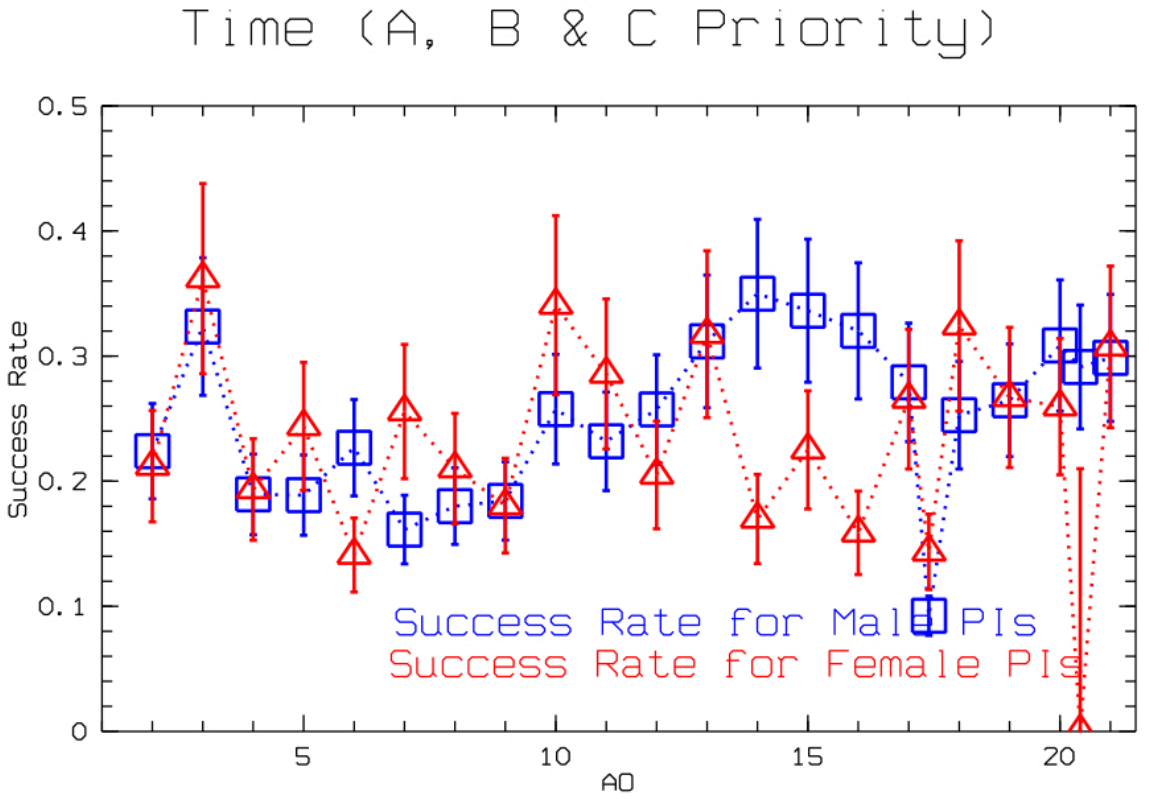


Fig. 43 The relative success rates of XMM-Newton proposals. The histograms show the difference between the actual number of successful proposals and the expected number based on the overall acceptance rate normalised by dividing by the square root of the number of expected proposals.


Time (A, B & C Priority)
Success Rate
0.5
0.4
0.3
0.2
0.1
0
5
10
15
20
AO
Success Rate for Male PIs
Success Rate for Female PIs

XMM-Newton Observing Time Proposals

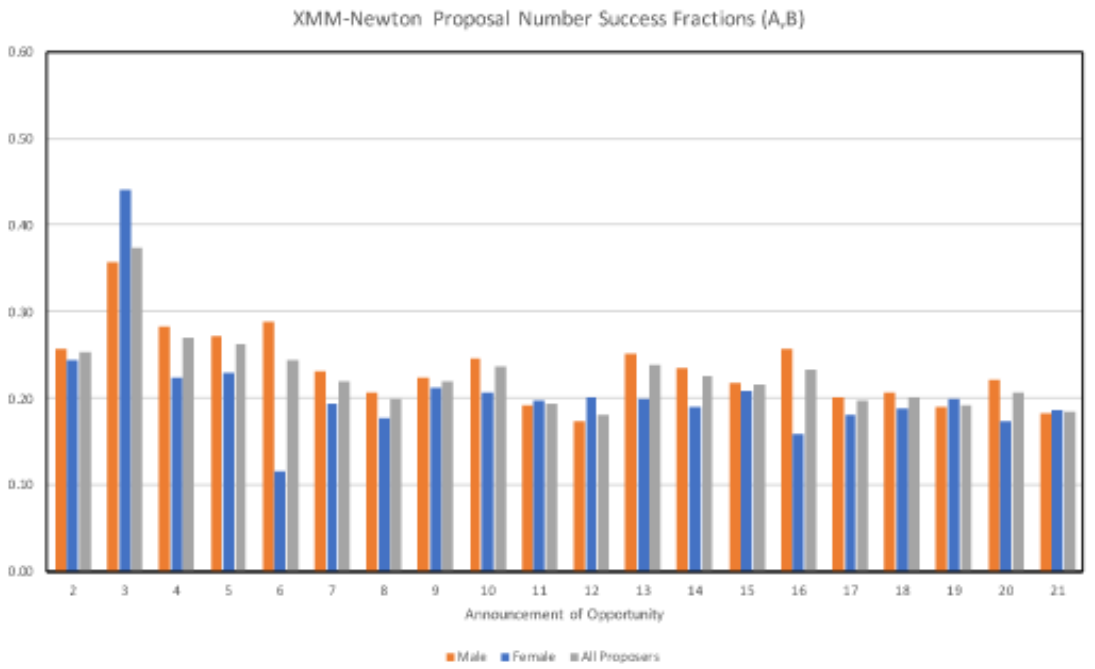


Fig. 44 The fraction of high-priority (A or B) proposals compared to the number submitted. The histograms show the success rates for male PI, female PI and all PIs.

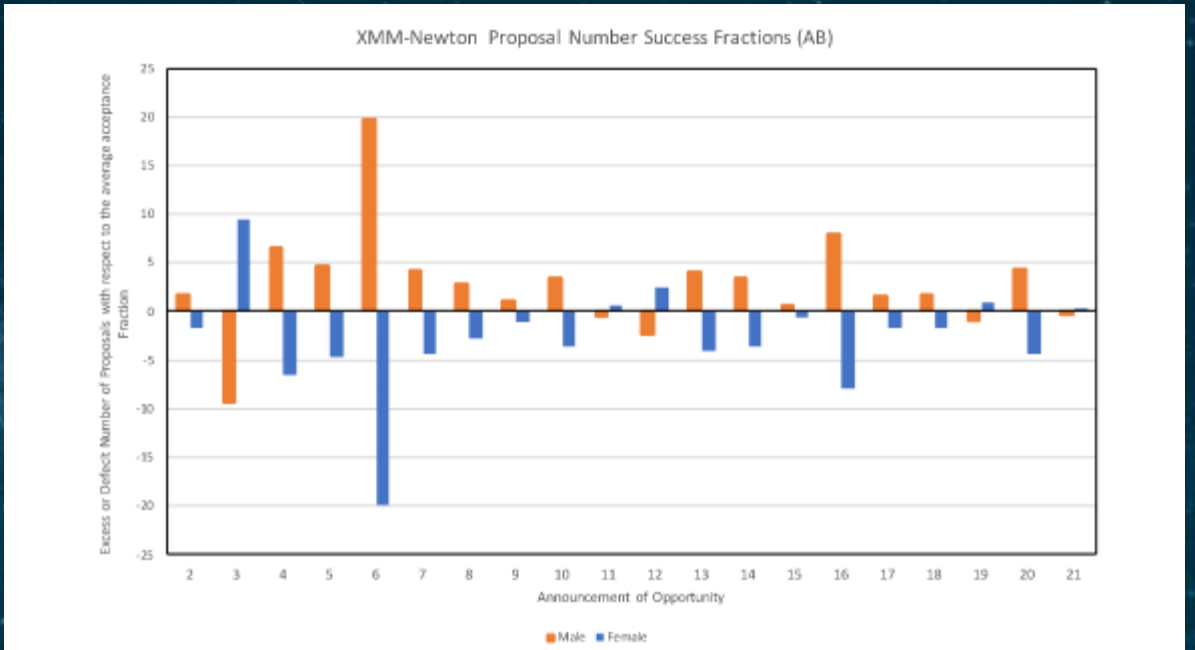


Fig. 45 The relative success rates of XMM-Newton high-priority proposals.The histograms show the difference between the actual number of successful proposals and the expected number based on the overall acceptance rate.

XMM-Newton Observing Time Proposals

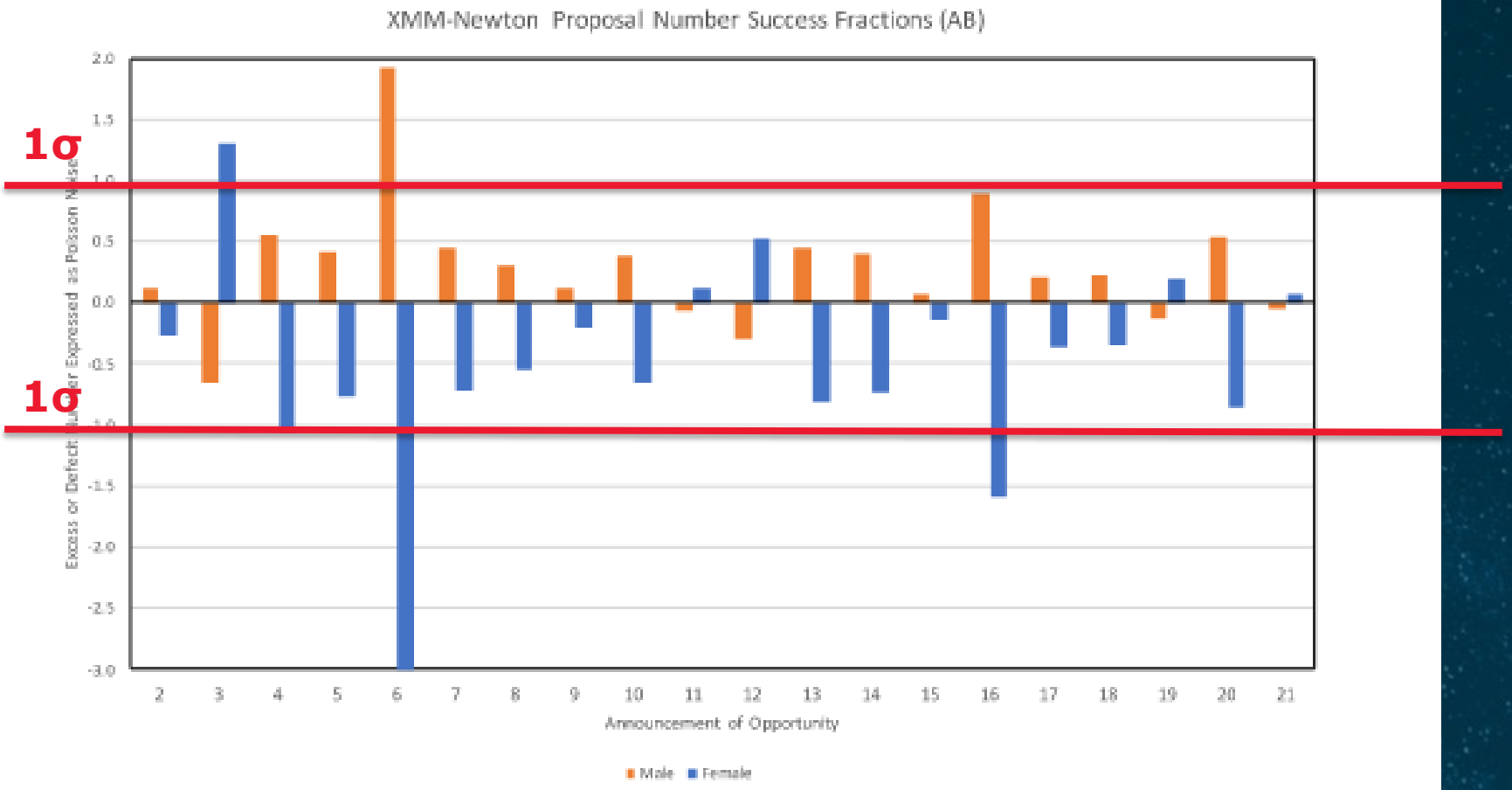
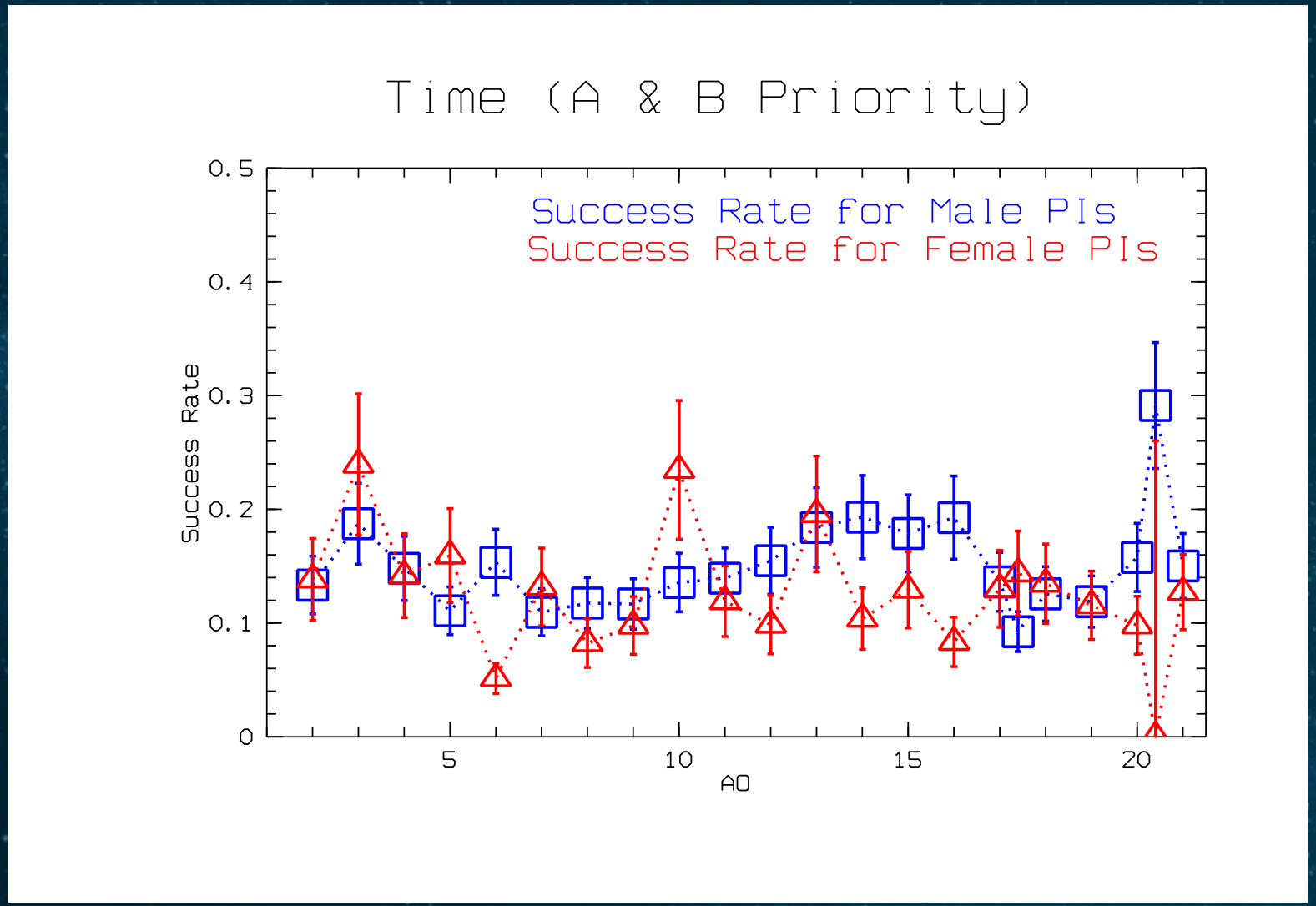
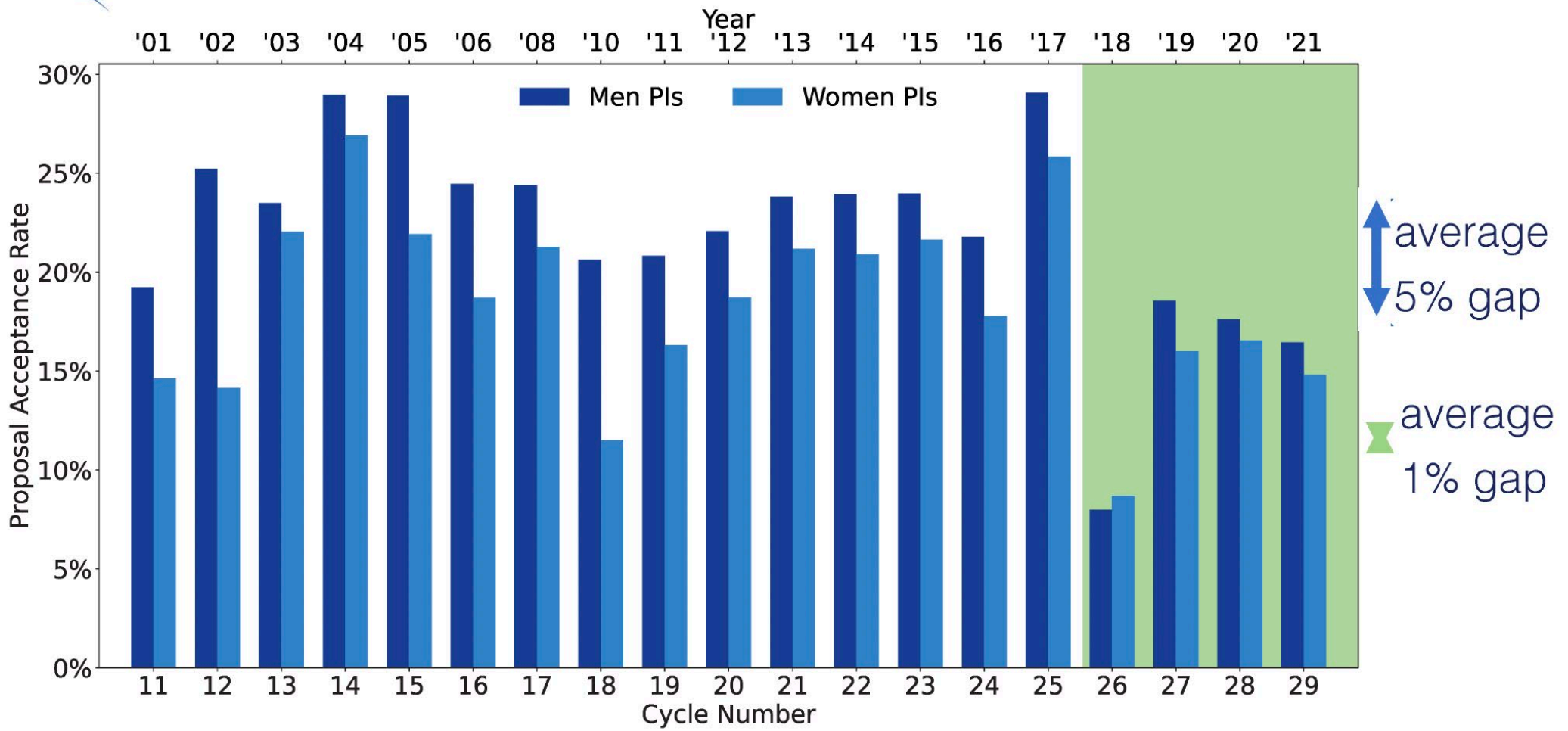


Fig. 46 The relative success rates of high-priority XMM-Newton proposals. The histograms show the difference between the actual number of successful proposals and the expected number based on the overall acceptance rate normalised by dividing by the square root of the number of expected proposals.


Time (A & B Priority)
Success Rate for Male PIs
Success Rate for Female PIs
Success Rate
0.5
0.4
0.3
0.2
0.1
0
5
10
15
20
AO

Dual anonymous & gender success rates



XMM-Newton Observing Time Proposals

Priority	Parameter	Proposal PI		
		All	Male	Female
	Proposals Submitted	10,579	7999	2580
A,B,C	Number Accepted	4287	3316	971
	Percentage Accepted	40.5 ± 0.7%	41.5 ± 1.0	37.7 ± 1.8
	Ratio Male/Female		1.100 ± 0.059	
A,B	Number Accepted	2467	1929	538
	Percentage Accepted	23.3 ± 0.5%	24.1 ± 0.6	20.9 ± 1.0
	Ratio Male/Female		1.155 ± 0.062	
	Time Requested (s)	1.97×10^9	1.49×10^9	4.81×10^8
A,B,C	Time Accepted (s)	4.82×10^8	3.68×10^8	1.14×10^8
	Percentage Time Accepted	24.4%	24.7%	23.6%
	Ratio Male/Female		1.045	
A,B	Time Accepted(s)	2.78×10^8	2.17×10^8	6.08×10^7
	Percentage Time Accepted	14.1%	14.6%	12.6%
	Ratio Male/Female		1.154	

cycle which was unusual in that it had many fewer proposals than the average. Subsequently, HST Cycles 27 to 29 which were also conducted with dual-anonymous reviews also showed higher male PI success rates. [27] report average male and female PI success rates of 16.2% and 14.8%, respectively for HST Cycles 26-29 (double-anonymous). This is a difference in favour of male PIs of 9.3%. This difference equals the difference of the XMM-Newton ABC-priority difference of 10.0±5.9%. In comparison, HST Cycles 22-25 have average male and female success rates of 25.1% and 22.2%. This is a larger difference in favour of male PIs of 13.2%. Thus dual-anonymous reviewing may *help* in providing more equitable outcomes. As [27] reports, the HST success rate of young proposers has increased under dual-anonymous reviewing from ~5% to ~30% which becomes now comparable with the XMM-Newton acceptance ratio value for young scientist of ~35%.

Summary

Taking all XMM-Newton proposals, all AOs and all observing priorities (A, B and C)

- Per construction no bias versus panel members or topics
- The relative success rate changes from AO to AO, i.e. there are AO where females are more successful and others where men are more successful
- A possible small (1.7-sigma) tendensy in favor of men proposer
- The tendency equals exactly the tensity in favor of men obtained after introduction of the double-anonymous system (data of 4 cycles)
- The acceptance rate increases from ~34% (before PhD) to ~47% (34 years after PhD)
- The acceptance rate of ~34% (before PhD) compares well with the acceptance rate for first time proposers (30%) obtained after introduction of the double-anonymous system (data of 4 cycles)
- The relative success rate of senior females (PhD > 20 year), is ~1-sigma below the relative success rate of me
- This potential bias is very small compared to the bias observed after introduction of the double-anonymous system

Possible Explanation

- Possible Explanation:
- The OTAC as set up for the XMM-Newton reviews, show a high social competence and sensitive
- OTAC members work hard to make fairest decisions
- OTAC members are taking unconscious biases and secondary, gender and age dependent, effects (language, presentation style, overstating ...) into account and “compensated” for them within the judgement fertilized by the openness of the process and discussion