Table. Patient Ratings of Reported Pain Between the Emoji-Based Visual Analog Scale and Numeric Rating Scale

	Emoji-based visual analog scale						
Numeric rating scale	0	2	4	6	8	10	Total
0	10	7	0	0	0	0	17
2	1	13	0	0	0	0	14
4	0	4	21	0	0	0	25
6	0	0	10	12	1	0	23
8	0	0	0	2	18	1	21
10	0	0	0	1	2	6	9
Total	11	24	31	15	21	7	109

visual option that could be a low-cost alternative to the numeric rating scale. Limitations of the study are the lack of a diverse population and use of a convenience sample rather than a random or purposive sample. Further work is needed to validate the emoji-based scale in diverse populations and with different types of scales.

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Association Between COVID-19 Booster Vaccination and Omicron Infection in a Highly Vaccinated Cohort of Players and Staff in the National Basketball Association

Evaluation of COVID-19 vaccine booster effectiveness is essential as new variants of SARS-CoV-2 emerge. Data support the effectiveness of booster doses in preventing severe disease and hospitalization; however, the association with reducing incident SARS-CoV-2 infections is not clear.[1-3] We compared the incidence of SARS-CoV-2 infection in players and staff of the National Basketball Association (NBA) who did vs those who did not receive a booster dose.

Methods | Players and staff who were tested more than once between December 1, 2021, and January 15, 2022, were included. Individuals were tested via the nucleic acid amplification test when symptomatic, after a known exposure, or during daily enhanced surveillance testing triggered by multiple cases on 1 team. Player vaccinations were not mandated. Staff were required to be fully vaccinated by October 1, 2021, and to have received a booster dose by January 5, 2022, if eligible. Masking requirements were similar between players and staff, with the exceptions of players unmasking on court and head coaches unmasking during games.

Genome sequencing was performed for all infections to determine the SARS-CoV-2 variant, but some sequencing failed due to inadequate sample volume, viral load, or genome coverage. Vaccination status was considered as a time-varying exposure; individuals could dynamically move through multiple categories during the study and contribute person-days accordingly. Fully vaccinated was defined as 2 doses of a 2-dose vaccination course (Pfizer-BioNTech BNT162b2 or Moderna mRNA-1273) or 1 dose of the 1-dose vaccination course (Johnson & Johnson JNJ-78436735)[4] and fully boosted was defined as 14 days after receiving any booster dose.

Hazard ratios (HRs) from an Andersen-Gill Cox proportional hazards model[5] compared time to infection for individuals who were fully vaccinated vs those who were fully boosted. Infections occurring after vaccination but prior to 14 days after vaccination were censored. The outcomes included

Table 1. Population Characteristics (N = 2613)

Characteristic	Fully boosted[a]	Fully vaccinated, not boosted, and booster eligible[b]
No. of person-days (No. of individuals)[c,d,e]	74 165 (2164)	10 890 (715)
Person-days, %[e]	73	11
Duration of follow-up, median (IQR) [range], d[d]	40 (25-45) [1-45]	11 (7-21) [1-45]
Individuals at study start (December 1, 2021), %	49	26
Individuals at study end (January 15, 2022), %	85	8
Sex, %[d]		
Male	87	89
Female	13	11
Age, median (IQR) [range], y[d]	35 (28-47) [19-84]	30 (25-39) [19-83]
Time since last dose (as of December 1, 2021), median (IQR) [range], d[d]	20 (14-31) [0-160]	216 (182-236) [25-321]
Had each primary vaccination type, %[d]		
mRNA	79	81
Viral vector	21	19
No. of individuals with confirmed SARS-CoV-2 infection during study[f]	608	127
Symptomatic, No. (%)	356 (59)	81 (64)
Crude incidence rate, cases per total person-days		
All infections	0.008	0.012
Symptomatic infections	0.005	0.007

[a] Defined as 14 days after receiving any booster dose. Vaccination status is a time-varying exposure, individuals can move through multiple categories and contribute person-days accordingly based on current vaccination status.

[b] Fully vaccinated was defined as 2 doses of a 2-dose vaccination course (Pfizer-BioNTech BNT162b2 or Moderna mRNA-1273) or 1 dose of the 1-dose vaccination course (Johnson & Johnson JNJ-78436735). Booster eligible was defined as 2 months after receiving JNJ-78436735 or 5 months after the second dose of mRNA vaccine. Vaccination status is a time-varying exposure, individuals can move through multiple categories and contribute person-days accordingly based on current vaccination status.

[c] During the course of the study, 1677 individuals contributed person-days to a single category (1339 as fully boosted; 165 as fully vaccinated, not boosted, and booster eligible; and 173 as an excluded category); 477 individuals changed categories 1 time contributing person-days to the corresponding category following a change in vaccination status (eg, within 14 days of a booster dose on December 1 and after 14 days became fully boosted); 454 individuals changed status 2 times (eg, began the study fully vaccinated and booster eligible on December 1, received a booster during the study period, and after 14 days became fully boosted); and 5 individuals changed status 3 times contributing person-days to 4 categories at different times throughout the study (eg, started the study fully vaccinated, not booster eligible, became booster eligible, received a booster dose, and after 14 days became fully boosted).

[d] Inclusive of all individuals who contributed person-days to a given category; individuals who contributed person-days to both categories can be counted twice in both categories.

[e] Reflects proportion of total person-days captured in each group. The percentage of person-days between the 2 comparison groups does not sum to 100% because 15 937 person-days (16% of total person-time) were attributed to categories excluded from the analysis: 423 person-days not vaccinated; 106 person-days partially vaccinated; 14 person-days when final dose of primary vaccination was within the prior 14 days; 6004 person-days fully vaccinated, not booster eligible; and 9390 person-days after booster dose but received booster within the prior 14 days.

[f] Diagnostic testing for COVID-19 was conducted via the nucleic acid amplification test using a midturbinate swab with the Cue Health system or the Accula test platform or a pooled nasal and oropharyngeal swab with the Roche cobas platform to detect the presence of SARS-CoV-2 RNA. All positive test results were confirmed with a subsequent test on the Roche cobas platform. Events were counted in the category corresponding to current vaccination status. Censored from the analysis were 8 infections recorded among unvaccinated individuals, 4 among those partially vaccinated, 84 among those fully vaccinated but not booster eligible, and 51 among those within 14 days of receiving a booster dose.

confirmed SARS-CoV-2 infections, symptomatic infections, COVID-19 hospitalizations, and COVID-19 deaths.

The models were adjusted for age and prior SARS-CoV-2 infection and the analyses were performed using SAS version 8.2 (SAS Institute Inc) and R version 4.1.1 (R Foundation for Statistical Computing). Statistical significance was defined as a 2-sided $P < .05$. The Advarra institutional review board determined the study met criteria for exemption status. Individuals signed health information authorizations allowing collection, storage, and use of health information by the NBA for monitoring purposes, including disclosure to medical experts.

Results | Of 2613 players and staff, 67% were followed up the entire 45-day study period, with 74 165 person-days contributed by fully boosted individuals and 10 890 person-days by those who were fully vaccinated but not boosted though eligible to receive a booster dose. From the start to the end of the study period, the percentage of individuals who were fully vaccinated and eligible for a booster dose decreased from 26% (n = 682) to 8% (n = 205) and the percentage of individuals who were fully boosted increased from 49% (n = 1282) to 85% (n = 2215); the remainder were in other categories, such as fully vaccinated but not yet eligible for a booster or within 14 days of their booster dose. In the overall cohort, 88% were male with a median age of 33.7 years (IQR, 27.3-45.2 years; **Table 1**).

Individuals who were fully boosted experienced 608 confirmed SARS-CoV-2 infections and were significantly less likely to be infected than fully vaccinated individuals who

Table 2. Association Between Booster Vaccination and SARS-CoV-2 Infection, December 1, 2021-January 15, 2022

Outcome	Adjusted HR (95% CI)[a]	*P* value
Any confirmed SARS-CoV-2 infection	0.43 (0.35-0.53)	<.001
Symptomatic SARS-CoV-2 infection	0.39 (0.30-0.50)	<.001

Abbreviation: HR, hazard ratio.

[a] The analyses were adjusted for age and prior SARS-CoV-2 infection. Comparison of individuals who were fully boosted vs those who were fully vaccinated, not boosted, and booster eligible (referent).

were booster eligible and had not received a booster, who had experienced 127 confirmed infections (adjusted HR, 0.43 [95% CI, 0.35-0.53], $P < .001$; **Table 2**). The secondary analyses evaluating symptomatic infection showed a similar association (adjusted HR, 0.39 [95% CI, 0.30-0.50]; $P < .001$). No hospitalizations or deaths occurred. Omicron was the dominant variant, representing 93% of 339 sequenced cases.

Discussion | This study found that in a young, healthy, highly vaccinated cohort frequently monitored for SARS-CoV-2, booster vaccination was associated with a significant reduction in incident infections during the Omicron wave. Study limitations include generalizability to older populations and the possibility that some infections may have been undetected in the absence of daily surveillance testing. This is a population that was recently boosted (median of 20 days as of December 1, 2021) and may not reflect waning efficacy over time. Surveillance testing in this population captured both symptomatic and asymptomatic infections, which differs from studies of the effectiveness of boosters that did not assess risk of asymptomatic infections.[2,3] Continued research is required to assess the need for additional booster doses beyond a single booster dose.

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