E-Cigarette Use and Adolescent Sports Participation: A Critically Appraised Topic

William DiGiuseppe, Stephanie H. Clines, PhD, ATC

Sacred Heart University, Fairfield, CT

CLINICAL SCENARIO

- The CDC reports more than 3.6 million adolescents and 20.8% of high school students currently use e-cigarettes.[1]
- E-cigarette use can result in an increase in respiratory airflow resistance, making it more difficult to breath, negatively impacting aerobic activity.[2,3]
- Nicotine can increase heart rate, blood pressure, vasoconstriction, endothelial dysfunction, and cause the acceleration of atherosclerosis.[1,4]
- Nicotine exposure is harmful for adolescent brain development with studies reporting attention-related decreases in brain activation within the frontal, parietal, subcortical, and occipital regions of the brain.[1,5]
- Ethanol, a common ingredient in found in 71% of e-liquid has been associated with reduced psychomotor function which would increase risk for contact sport athletes.[3,6,7]

FOCUSED CLINICAL QUESTION

- In adolescents, does sport participation reduce the prevalence of e-cigarette use?

SUMMARY OF SEARCH, "BEST EVIDENCE" APPRAISED, AND KEY FINDINGS

- Literature was searched in September of 2019 for studies of Level 2 evidence or higher that investigated the prevalence of e-cigarette use among adolescent athletes.
- The literature search yielded 45 possible studies for inclusion.
- Three cohort studies[8-10] and one cross sectional study[11] met the inclusion and exclusion criteria.
- All studies were critically appraised using the STROBE criteria.

Key Findings

- Male athletes are more likely to experiment and use e-cigarette products than their non-athlete peers.
- Male athletes were more likely to experiment with e-cigarette use than female atheltes[11]
- Athletes participating in baseball, wrestling, lacrosse, and football were more likely to use e-cigarettes than any other sport.[8,11]

SEARCH STRATEGY

Terms Used to Guide Search Strategy

- **P**opulation: *middle school and high school adolescents*
  Intervention: *athletic participation*
- **C**omparison: *no athletic participation*
- **O**utcome: *e-cigarette use OR vaping*

Sources of Evidence Searched

- CINHAL
- MEDLINE
- Sacred Heart University Library
- Hand search through existing literature

Inclusion Criteria

- Population: adolescents (<18 years of age)
- Studies that compared e-cigarette use to athletic participation
- Language: English only
- Publication Date: 2009-present
- Study designs of level 2 evidence or higher

Exclusion Criteria

- Adult population (≥18 years of age)
- Studies that did not differentiate between e-cigarette use and standard tobacco use
- Does not assess athletic participation

RESULTS OF SEARCH

Table 1. Summary of Study Designs of Articles Reviewed.

Author	Study Design	Level of Evidence*	STROBE Score
Kinnunen et al.,[8]	Cohort Study	2	20/22
Veliz et al., [11]	Cross-Sectional	2	19/22
Chaffee et al. [9]	Cohort Study	2	21/22
Milicic et al., [10]	Cohort Study	2	21/22

***Level of evidence assessed using the SORT taxonomy .**

CLINICAL BOTTOM LINE

- There is consistent limited-quality evidence refuting the hypothesis that sport participation reduces the likelihood of e-cigarette use, particularly in males.

Strength of Recommendation

- There is Grade B evidence suggesting that athletic participation does not decrease the prevalence of e-cigarette use. The SORT taxonomy recommends grade B based on inconsistent or limited-quality patient-oriented evidence.

IMPLICATIONS FOR PRACTICE, EDUCATION, AND FUTURE RESEARCH

- While it is commonly assumed that athletes make healthy life choices, literature has identified that that student athletes, specifically males, are at an increased likelihood to experiment with e-cigarettes compared to their non-athlete peers.[8-11] Clinicians, coaches, school administrators, and parents should be aware that athletes are also experimenting with these products and take appropriate steps to educate these youths on the associated risks of e-cigarette use.
- Additionally, adults should pay special attention to athletes participating in contact sports (football, wrestling, lacrosse) as these adolescents tend to be risk takers and experiment with tobacco products more than athletes of other sports.[11]
- Having friends who use tobacco products has been identified as a factor influencing e-cigarette experimentation in adolescents.[8,9] As part of a team, youths spend large amounts of time together, leaving ample opportunity for peer influence to occur among teammates. Future research should investigate if team specific education programs regarding the health risks of e-cigarettes is effective in reducing use of these products.

REFERENCES

1. US Department of Health and Human Services, Public Health Service, Office of the Surgeon General. E-Cigarette Use Among Youth and Youth Adults: A Report of the Surgeon General. Atlanta, GA : US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2016. Available at: https://e-cigarettes.surgeongeneral.gov/documents/2016_SGR_Full_Report_non-508.pdf.
2. Vardavas CI, Anagnostopoulos N, Kougias M, Evangelopoulou V, Connolly GN, Behrakis PK. Short-term pulmonary effects of using an electronic cigarette: impact on respiratory flow resistance, impedance, and exhaled nitric oxide. Chest 2012;141(6):1400-1406.
3. Eltorai AE, Choi AR, Eltorai AS. Impact of electronic cigarettes on various organ systems. *Respir Care*. 2019;64(3):328-336. doi:10.4187/respcare.06300
4. Bhatnagar A, Whitsel LP, Ribisl KM, et al; American Heart Association Advocacy Coordinating Committee, Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology, Council on Quality of Care and Outcomes Research. Electronic cigarettes: a policy statement from the American Heart Association. *Circulation*. 2014;130(16):1418-1436.
5. Kobiella A, Ripke S, Kroemer NB, et al. Acute and chronic nicotine effects on behaviour and brain activation during intertemporal decision making: Discounting under nicotine. *Addiction Biology*. 2014;19(5):918-930. doi:10.1111/adb.12057
6. Varlet V, Farsalinos K, Augsburger M, Thomas A, Etter JF. Toxicity assessment of refill liquids for electronic cigarettes. Int J Environ Res Public Health 2015;12(5):4796-4815.
7. Valentine GW, Jatlow PI, Coffman M, Nadim H, Gueorguieva R, Sofuoglu M. The effects of alcohol-containing e-cigarettes on young adult smokers. Drug Alcohol Depend 2016;159:272-276.
8. Kinnunen J, Ollila H, Minkkinen J, Lindfors P, Rimpela A. A longitudinal study of predictors for adolescent electronic cigarette experimentation and comparison with conventional smoking. *IJERPH*. 2018;(2):305. doi:10.3390/ijerph5020305
9. Chaffee BW, Couch ET, Urata J, Gansky SA, Essex G, Cheng J. Predictors of smokeless tobacco susceptibility, initiation, and progression over time among adolecents in a rural cohort. *Substance Use & Misuse*. 2019;54(7):1154-1166. doi:10.1080/10826084.2018.1564330.
10. Milicic S, Pierard E, DeCicca P, Leatherdale S. Examining the association between physical activity, sedentary behavior and sport participation with e-cigarette use and smoking status in a large sample of Canadian youth. *Nicotine & Tobacco Research*. 2017;21(3):285-292. doi:10.1093/ntr/ntx238.
11. Veliz P, McCabe SE, McCabe VV, Boyd CJ. Adolescent sports participation, e-cigarette use, and cigarette smoking. *American Journal of Preventive Medicine*. 2017;53(5):e175-e183. doi:10.1016/j.amepre.2017.06.032.