

HEALTH BENEFITS OF DIFFERENT TYPES OF SKIING

¹Srećko Stanišić,

²Blaz Lešnik,

³Saša Kovačević.

¹ Faculty of Physical Education and Sport, University of East Sarajevo,

² Faculty of Sport, University of Ljubljana, Slovenia,

³ Sports Gymnastics Association „Spartak“, Banja Luka.

ISSN 1840-152X

UDK: 616.12-008:796.9-053.9

<https://doi.org/10.7251/SIZ2401193S>

<https://sportizdravlje.ues.rs.ba/index.php/sah>

<https://doisrpska.nub.rs/index.php/SIZ>

REVIEW ARTICLE

Abstract: Objective: This review aims to synthesize current research on the impact of skiing activities-alpine, cross – country, and recreational – on cardiovascular health and physical fitness among the elderly population. Method: A comprehensive literature review was conducted using databases such as PubMed and Google Scholar, selecting studies based on intervention type, participant age group, and publication date. Results: The review identified significant benefits of skiing activities on cardiovascular health parameters, including improved blood pressure, lipid profiles, and reduced risk factors for coronary artery diseases. Furthermore, skiing was found to enhance physical fitness aspects such as muscular strength, balance, and aerobic capacity in individuals aged 60 years and older. Conclusion: The review suggests that engaging in skiing, whether alpine, cross-country, or recreational, can substantially benefit cardiovascular health and physical fitness. These findings can inform fitness professionals, coaches, and the elderly about the potential health benefits of incorporating skiing into their physical activity regimen.

Key words: health benefits, skiing, cardiovascular parameters

INTRODUCTION

The effects of skiing, particularly cross-country skiing, on health have been extensively studied, revealing multiple benefits in physical, psychological, and cardiometabolic health domains. This introduction synthesizes findings from recent systematic reviews and meta-analyses to provide a comprehensive overview of the current state of knowledge on the health impacts of skiing.

Cross-country skiing is known for its demanding physical nature, requiring both endurance and strength. A systematic review by Castaneda-Babarro et al. (2022) highlighted that strength training, when incorporated into cross-country skiers' training routines, can improve performance metrics such as double-pole efficiency, maximum strength, and, in some cases, measures of aerobic capacity like VO₂max (maximum oxygen consumption). However, the impact on peak oxygen consumption was found to be inconsistent, suggesting a complex interaction between different forms of physical training and athletic performance.

In addition to purely physical benefits, the context in which skiing and other forms of exercise are performed – outdoors or indoors – has been shown to influence both mental and physical health. Noseworthy et al. (2023) explored this by reviewing longitudinal studies comparing outdoor and indoor exercise. Their review suggested that while there are indications that outdoor exercise, including skiing, offers additional health benefits such as improved psychological well-being, evidence remains limited and calls for more rigorous studies to draw definitive conclusions. Notably, any statistically significant comparison favored outdoor exercise, enhancing the potential for additional benefits from engaging in physical activity in natural settings.

A study focused on young swimmers demonstrated a positive impact of hip joint flexibility on the efficiency of turns, emphasizing the broader principle that flexibility contributes to more efficient and safer execution of sport-specific movements (Djurovic et al., 2017). Similarly, in skiing, where dynamic movements and quick turns are paramount, flexibility may help skiers achieve smoother techniques and minimize the risk of falls or injuries. This connection suggests that incorporating flexibility exercises into skiers' training regimens could provide health benefits similar to those observed in swimmers, improving performance while protecting against common skiing-related injuries.

Alpine skiing has been shown to have significant positive effects on health-related quality of life (HRQoL), physical self-concept (PSC), and intrinsic sport motivation, especially among physically active adults over the age of 55. A study involving 280 Spanish adults, 75.35% of whom were skiers, found that those who participated in alpine skiing reported higher PSC values, physical components of HRQoL (which include aspects such as physical function), and intrinsic motivation compared to their non-skiing counterparts. This suggests that alpine skiing can contribute to healthy aging and improve the quality of life in older adults (Conde-Pippo et al., 2022).

Moreover, the importance of balance in alpine skiing cannot be overstated, as it is directly correlated with specific skiing skills and situational effectiveness. Several studies have explored the effects of balance training on alpine skiing performance, showing that specialized training programs can significantly improve balance abilities in skiers. This is particularly relevant for young skiers, where improvements in postural balance have been observed as a result of skiing training. The relationship between balance ability and skiing performance highlights the multiple benefits of skiing, not only in terms of physical health but also in enhancing specific skills crucial to the sport.

The primary aim of this systematic review is to comprehensively analyze and synthesize existing research on the effects of skiing on health, focusing on identifying both the benefits and risks associated with this popular physical activity. The objectives include assessing the impact of skiing on physical health parameters such as cardiovascular fitness, muscular strength, and injury rates, as well as evaluating its effects on mental health and well-being. By systematically reviewing the available literature, this study aims to clarify the health implications of skiing, provide evidence-based recommendations for safe and effective practice, and suggest directions for future research in this field. This endeavor seeks not only to

contribute to academic discourse but also to offer practical insights that can improve the health and safety of skiing enthusiasts worldwide.

METHODS

To ensure a comprehensive investigation of the effects of skiing on health, a systematic search was conducted across multiple databases known for their extensive repositories of scientific literature. The primary databases included PubMed and Google Scholar, chosen for their broad coverage of medical and sports science research. The search strategy was designed to capture a wide range of studies, using a combination of keywords and phrases related to skiing and health outcomes. These keywords included "skiing," "cross-country skiing," "skiing and health," "skiing injuries," "cardiovascular health in skiing," and "benefits of skiing for mental health."

Inclusion and Exclusion Criteria

To maintain a focused and relevant review, specific inclusion and exclusion criteria were established. The inclusion criteria covered studies that: (1) explicitly examine the health effects of skiing, (2) were conducted on humans of any age and skill level, and (3) provide clear outcomes related to physical or mental health. These criteria aimed to ensure that studies directly addressed the research question and were suitable for analysis.

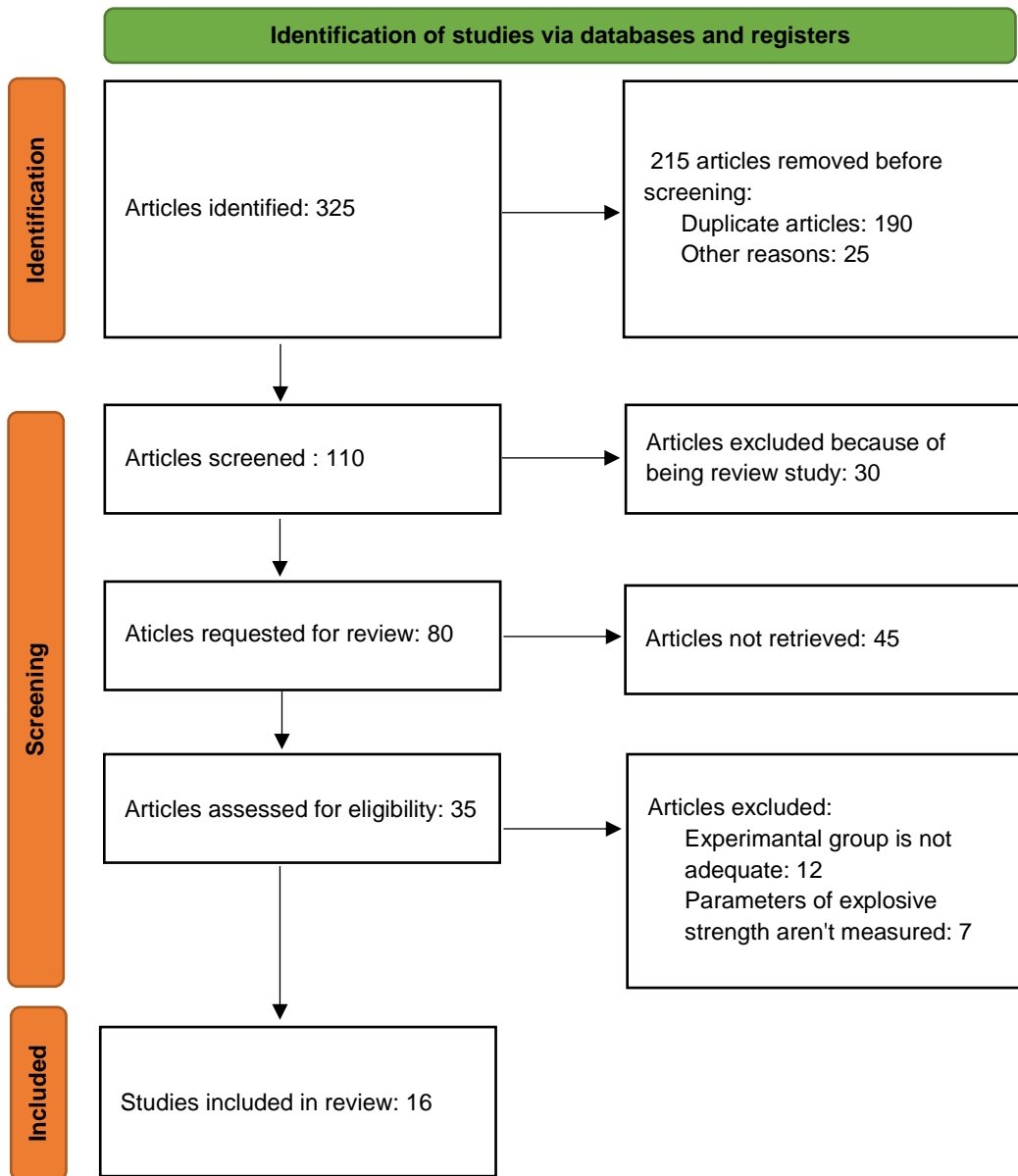
Exclusion criteria were applied to studies that: (1) focused on indirect aspects of skiing such as economic impacts or environmental considerations, (2) dealt with winter sports or activities not specifically related to skiing, (3) were review articles, editorials, or commentaries rather than original research, and (4) lacked peer review, ensuring the scientific validity of the included studies.

RESULTS

A total of 325 potentially relevant papers were identified. Through a detailed analysis and the application of the defined inclusion and exclusion criteria, the number of papers was reduced. From the initial set, 215 papers were excluded: 190 due to duplication and 25 for not meeting the inclusion criteria or aligning with the exclusion criteria. After this step, 110 papers remained for further analysis.

After a thorough review, it was found that 30 of the remaining 110 papers were systematic review articles. Although these papers were relevant for providing a broader context, they were outside the scope of the primary research analysis. Consequently, 80 studies remained for further detailed analysis. At the end of this process, it was concluded that 16 studies met all the inclusion criteria for this systematic review.

Figure 1. Selection Process of Papers (Origin: Prisma 2020 flow diagram for new systematic review⁵)



⁵ <http://prisma-statement.org/prismastatement/flowdiagram.aspx?AspxAutoDetectCookieSupport=1>

Table 1. Presentation of Results

Reference	Number of Participants			Duration	Intervention	Final
	N	Sex	Age			
Conde-Pipó et al., 2022	280	M, F	>50	NA	AS	KŽ+, HRQoL+, PSC+
Keskin-Aktan, Keskin-Dilbay, & Kutlay, 2022	68	M, F	18-25	NA	AS	FP+, KŽ+
Niederseer et al., 2021	48	M,F	60-76	12 weeks	RS	O2max+, HR+
Kim, Jung & Choi, Yong. 2020	7	M,F	NA	NA	CCS	MM+, ES+
Laukkanen et al., 2020	25	M	53	23 weeks	CCS	KV+
Lee et al., 2019	238	M	NA	1 day	OS	S-,
Rossi et al., 2019	39	M,F	NA	NA	AS	KŽ+, KV+
Degache et al., 2018	40	M,F	NA	1 day	AS	HR+, KP+
Haslinger et al., 2018	50	M,F	NA	1 week	SP	KS-, ES-, MZ-
Niederseer et al., 2016	42	M,F	66.6 ± 2.1	12 weeks	VS	AE+, PAT+,
Stöggl et al. 2016	21	M,F	NA	NA	AS, CCS, IC	O2max, EE
Burtscher et al. 2013	1259	M,F	57.3+14.6	D	AS	KŽ, KV+
Alvarez-San Emeterio et al., 2011	39	M,F	13-16	24 weeks	AS	MM+, ES+
Dela et al. 2011	42	M,F	67.5 ± 2.8	12 weeks	AS	TK+, KV+
Müller et al., 2011	47	M, F	60-76	12 weeks	AS	O2max+, ES+, KP+
Niederseer et al., 2011	42	M,F	66.6 ± 2.1	12 weeks	AS	TK+, KV+

AE - Anti-ergogenic effects, AS - Alpine skiing, CCS - Cross-country skiing, D - Long-term, EE - Energy expenditure, ES - Eccentric strength, ES - Explosive strength, F - Female sex, FP - Physical performance, HR - Heart rate, HRQOL - Health-related quality of life, IC - Indoor cycling, KP - Posture control, KS - Concentric strength, KV - Cardiovascular parameters, KŽ - Quality of life, M - Male sex, MM - Muscle mass, MZ - Muscle fatigue, NA - Not available, O2max - Maximum oxygen capacity, OS - Ski training, PAT - Peripheral arterial tone, PSC - Physical self-concept, RS - Recreational skiing, S - Stress, SP - Ski mountaineering, TK - Body composition, VS - Guided skiing, +- Improvement, - Decrease

DISCUSSION

The analyzed studies included both male and female participants. Only two studies involved exclusively male participants (Lee et al., 2019; Laukkanen et al., 2020), while none focused solely on female participants. Mixed-gender groups were present in 14 studies (Burtscher et al., 2013; Alvarez-San Emeterio et al., 2011; Dela et al., 2011; Müller et al., 2011; Niederseer et al., 2011; Stöggl et al., 2016; Niederseer et al., 2016; Rossi et al., 2019; Kim, Jung, & Choi, 2020; Niederseer et al., 2021; Conde-Pipó et al., 2022; Keskin-Aktan, Keskin-Dilbay, & Kutlay, 2022; Degache et al., 2018; Haslinger et al., 2018).

Regarding the participants' age, the youngest participants were in the study by Keskin-Aktan et al. (2022), aged 18-25 years, and the oldest participants were in the studies by Müller et al. (2011) and Niederseer et al. (2021), aged 60-76 years.

The interventions varied across studies. The most common intervention was alpine skiing (AS), which was used in the majority of studies.

The results showed that the most frequent outcome was an improvement in quality of life (QoL+), observed in the studies by Burtscher et al. (2013), Rossi et al. (2019), Conde-Pipó et al. (2022), Keskin-Aktan et al. (2022). Following this,

improvements in cardiovascular parameters (CV+) were seen in studies by Dela et al. (2011), Niederseer et al. (2011), Burtscher et al. (2013), Rossi et al. (2019), Laukkanen et al. (2020). Additionally, increases in maximal oxygen capacity (O₂max+) were observed in the studies by Müller et al. (2011) and Niederseer et al. (2021).

Improvement in cardiovascular parameters (CV+) was one of the most commonly found results in multiple studies (Dela et al., 2011; Niederseer et al., 2011; Burtscher et al., 2013; Rossi et al., 2019; Laukkanen et al., 2020).

The most common shared results across studies were improvements in cardiovascular parameters (CV+), quality of life (QoL+), and physical performance (FP+), indicating that skiing, both alpine and cross-country, can have a positive impact on heart health, well-being, and physical ability. It is particularly interesting that some studies found specific results, such as improvements in muscle mass and strength, which could be a direct consequence of the type and intensity of activity involved in skiing. These findings highlight the potential of skiing as a beneficial physical activity for improving overall health and fitness, especially among older adults.

Similarly, a study focusing on the impact of alpine skiing on quality of life and physical self-concept in adults over 55 years observed improvements in physical self-concept (PSC), the physical component of health-related quality of life (HRQoL), and intrinsic motivation among skiers. This suggests that alpine skiing can indeed improve quality of life and contribute to healthy aging (Conde-Pipó et al., 2022).

The findings presented in the table from various studies regarding the health benefits of skiing, particularly alpine skiing, are in line with findings from other recent research. For instance, a review of the potential health benefits of alpine skiing emphasized that regular engagement in this activity can contribute to healthy aging by promoting a healthier lifestyle, including higher levels of physical activity. The findings from the table align with a study suggesting that alpine skiing can have favorable effects on the musculoskeletal system, postural control, adaptation to cold temperatures and occasional hypoxia, as well as emotional and social benefits arising from outdoor recreation (Burtscher et al., 2019).

Furthermore, the findings are consistent with studies that provide a comprehensive overview of the health benefits of skiing and snowboarding, including calorie burning, strengthening the lower body, improving flexibility, core muscle strength, bone and joint health, cardiovascular circulation, insulin resistance, proprioception, mood improvement, and enhanced deep sleep. These benefits emphasize the role of skiing in maintaining physical fitness and overall well-being (Knott, 2022).

In summary, the evidence from the reviewed studies and recent literature consistently supports the positive impact of skiing, especially alpine skiing, on various aspects of health, including physical fitness, cardiovascular health, and mental well-being, among others. While most studies focused on mixed-gender groups, specific findings related to male participants in Laukkanen et al. (2020) and Lee et al. (2019) on cardiovascular parameters and stress reduction further enrich our understanding of the health effects of skiing.

CONCLUSION

The collective findings from the review, supported by recent studies, highlight the multiple health benefits of skiing, particularly for older adults. These benefits include cardiovascular improvements, increased muscle strength and mass, better quality of life, and reduced cardiovascular risks, which are well aligned with broader fitness goals and health maintenance strategies. It is important to note that although skiing offers a unique combination of aerobic training, strength training, and balance, it also provides a pleasant alternative to conventional exercises, potentially increasing adherence to physical activity during the colder months. However, it is crucial to acknowledge the participation of both sexes in most studies, emphasizing the universal applicability of the health benefits of skiing across different demographic groups. Future research should continue to explore the health impacts of skiing, particularly in identifying the specific mechanisms behind its benefits and optimizing skiing interventions for various populations.

REFERENCES

- Alvarez-San Emeterio, C., Antuñano, N. P., López-Sobaler, A. M., & González-Badillo, J. J. (2011). Effect of strength training and the practice of Alpine skiing on bone mass density, growth, body composition, and the strength and power of the legs of adolescent skiers. *Journal of Strength and Conditioning Research*, 25(10), 2879–2890. <https://doi.org/10.1519/JSC.0b013e31820c8687>
- Burtscher, M., Bodner, T., Burtscher, J., Ruedl, G., Kopp, M., & Broessner, G. (2013). Lifestyle characteristics and cardiovascular risk factors in regular downhill skiers: An observational study. *BMC Public Health*, 13(1), 788.
- Burtscher, M., Federolf, P. A., Nachbauer, W., & Kopp, M. (2019). Potential health benefits from downhill skiing. *Frontiers in Physiology*. <https://doi.org/10.3389/fphys.2018.01924>
- Conde-Pipó, J., Valenzuela-Barranco, I., López-Moro, A., Román-Alconchel, B., Mariscal-Arcas, M., & Zurita-Ortega, F. (2022). Influence of Alpine Skiing on Health-Related Quality of Life and Physical Self-Concept in Physically Active Adults over 55 Years of Age. *Sports*, 10(10), 153. <https://doi.org/10.3390/sports10100153>
- Degache, F., Bonjour, A., Michaud, D., Mondada, L., & Newman, C. J. (2018). The effects of tandem skiing on posture and heart rate in children with profound intellectual and multiple disabilities. *Developmental Neurorehabilitation*, 22(4), 234–239. <https://doi.org/10.1080/17518423.2018.1462268>
- Dela, F., Niederseer, D., Patsch, W., Pirich, C., Müller, E., & Niebauer, J. (2011). Glucose homeostasis and cardiovascular disease biomarkers in older alpine skiers. *Scandinavian Journal of Medicine & Science in Sports*, 21, 56-61.
- Djurovic, M., Okicic, T., Madić, D., Dopsaj, M., Thanopoulos, V., Rozi, G., Pešić, M., & Trivun, M. (2017). The influence of flexibility on the specific motor skills in boy-swimmers aged 10–12. In *Proceedings of the 2017 International Conference on Applied Sports Science* (pp. 154-158). Bulgarian Sports Academy. <https://doi.org/10.37393/ICASS2017/32>
- Haslinger, S., Blank, C., Morawetz, D., Koller, A., Dünwald, T., Berger, S., Schlickum, N., & Schobersberger, W. (2018). Effects of Recreational Ski Mountaineering on Cumulative Muscle Fatigue - A Longitudinal Trial. *Frontiers in Physiology*, 9, 1687. <https://doi.org/10.3389/fphys.2018.01687>

Keskin-Aktan, A., Keskin-Dilbay, N., & Kutlay, Ö. (2022). Effect of Skiing on Physical Performance, Pain, and Quality of Life Based on Gender. *Journal of Sport Rehabilitation*, 31(7), 885–893. <https://doi.org/10.1123/jsr.2021-0334>

Kim, J., & Choi, Y. (2020). The effect of short-term off-season cross-country ski training on body composition, physical fitness, and isokinetic muscle functions of cross-country skiers. *Journal of Men's Health*, 16(1), e63–e74. <https://doi.org/10.15586/jomh.v16i1.201>

Knott, S. (2022). 12 Incredible Health Benefits of Skiing & Snowboarding. *New To Ski*. <https://newtoski.com/health-benefits-of-skiing-snowboarding/>

Laukkanen, J. A., Lakka, T. A., Ogunjesa, B. A., Kurl, S., & Kunutsor, S. K. (2020). Cross-country skiing and the risk of acute myocardial infarction: A prospective cohort study. *European Journal of Preventive Cardiology*, 27(10), 1108–1111. <https://doi.org/10.1177/2047487319869696>

Lee, H. W., Yoo, J., Cha, J. Y., Ji, C. H., Eun, D., Jang, J. H., Ju, H. W., Park, J. M., & Jee, Y. S. (2019). Effects of winter skiing on stress, heart rate, apprehension, and enjoyment in collegiate students: a single randomized controlled trial. *Journal of Exercise Rehabilitation*, 15(2), 235–241. <https://doi.org/10.12965/jer.1938116.058>

Müller, E., Gimpl, M., Kirchner, S., Kröll, J., Jahnel, R., Niebauer, J., Niederseer, D., & Scheiber, P. (2011). Salzburg Skiing for the Elderly Study: Influence of alpine skiing on aerobic capacity, strength, power, and balance. *Scandinavian Journal of Medicine & Science in Sports*, 21(Suppl 1), 9–22. <https://doi.org/10.1111/j.1600-0838.2011.01337.x>

Niederseer, D., Ledl-Kurkowski, E., Kvita, K., Patsch, W., Dela, F., Mueller, E., & Niebauer, J. (2011). Salzburg Skiing for the Elderly Study: changes in cardiovascular risk factors through skiing in the elderly. *Scandinavian journal of Medicine & Science in Sports*, 21 (Suppl 1), 47–55. <https://doi.org/10.1111/j.1600-0838.2011.01341.x>

Niederseer, D., Steidle-Kloc, E., Mayr, M., Müller, E. E., Cadamuro, J., Patsch, W., Dela, F., Müller, E., & Niebauer, J. (2016). Effects of a 12-week alpine skiing intervention on endothelial progenitor cells, peripheral arterial tone and endothelial biomarkers in the elderly. *International journal of Cardiology*, 214, 343–347. <https://doi.org/10.1016/j.ijcard.2016.03.229>

Niederseer, D., Walser, R., Schmied, C., Dela, F., Gräni, C., Bohm, P., Müller, E., & Niebauer, J. (2021). Effects of a 12-Week Recreational Skiing Program on Cardio-Pulmonary Fitness in the Elderly: Results from the Salzburg Skiing in the Elderly Study (SASES). *International Journal of Environmental Research and Public Health*, 18(21), 11378. <https://doi.org/10.3390/ijerph182111378>

Rossi, V. A., Schmied, C., Niebauer, J., & Niederseer, D. (2019). Cardiovascular effects and risks of recreational alpine skiing in the elderly. *Journal of Science and Medicine in Sport*, 22(Suppl 1), S27-S33. <https://doi.org/10.1016/j.jsams.2019.01.016>

Stöggel, T., Schwarzl, C., Müller, E. E., Nagasaki, M., Stöggel, J., Scheiber, P., Schönfelder, M., & Niebauer, J. (2016). A Comparison between Alpine Skiing, Cross-Country Skiing and Indoor Cycling on Cardiorespiratory and Metabolic Response. *Journal of Sports Science & Medicine*, 15(1), 184–195.

Correspondence:

Srećko Stanišić,

Faculty of Physical Education and Sport, University of East Sarajevo.

e-mail: sreckostanistic@gmail.com