Road safety factsheet: Cycle helmets

May 2023

Cycle helmets are designed to offer protection and reduce impact to the head of a person cycling who falls or is in a collision when riding a bike. Although the Highway Code (rule 59) states that 'you should wear a cycle helmet that conforms to current regulation, is the correct size and securely fastened[1]', there is no legal requirement in the UK to wear a cycle helmet.

How cycle helmets work

Bicycle helmets typically have a plastic thin shell on the outside with polystyrene foam inside, they also have straps that help keep the helmet in place during normal use and in the event of a crash. The foam inside the helmet is designed to crush on impact in the event of a fall or collision, helping to disperse and cushion the force of the impact. The plastic shell is designed to keep the foam in place and help slide along the impact surface rather than bringing the helmet to a jarring halt[2].

Some modern helmets also have a Multi-directional Impact Protection System (MiPS) inside the helmet, this is a thin liner attached to the inside that helps to redirect dangerous rotational forces that the brain can be subjected to in a fall or collision. You are able to find a short video to explain how MiPS works here . Similar technologies such as SPIN (Shearing Pad INside) and WaveCel are also available.

Choosing a cycle helmet

There are many different kinds of cycle helmets available in the UK, ranging in price. However, if you do choose to buy a cycle helmet, there are a number of things to consider.

Safety

In Europe, cycle helmets need to comply with the EN1078 standard to acquire the CE mark. Additionally, a specific standard has been developed for helmets intended for younger children, known as EN1080. The key distinction between EN1080 and EN1078 lies in the attachment of the chin strap. In an EN1080 standard helmet, the chin strap is designed to detach during a collision. This crucial feature aims to prevent any risk of choking or strangulation if the helmet gets caught or entangled[3].

[1] GOV UK. Highway Code, Rules for cyclists (59-82); https://www.gov.uk/guidance/the-highway-code/rules-for-cyclists-59-to-82: Accessed May 2023
[2] Trek Cycles. How to find the best bike helmet; https://www.trekbikes.com/ca/en_CA/bike_helmet_guide/: Accessed May 2023
[3] SWOV (2017) 'Bicycle Helmets'; https://www.swov.nl/en/facts-figures/factsheet/bicycle-helmets: Accessed May 2023

However, some researchers have suggested that the EN1078 standard offers less protection than other standards such as the Snell test[4] or the American and Australian standards. These standards are thought to be more rigorous in their testing. However, it is important to note that there is currently no evidence to suggest a decrease in brain trauma during head impact accidents when using helmets adhering to these standards[5].

In Sweden, the Folksam Insurance group has developed its own bicycle helmet safety test [6]. From 2019-2021, the Road Safety Trust commissioned them to publish a report on their annual cycle helmet safety test results. This involved conducting five physical tests, including two shock absorption tests with direct perpendicular impact, three oblique impact tests, and computer simulations to assess the risk of concussion.

The safety level of each helmet was then compared to the average test results of all helmets tested. To receive the "Recommended" label, indicating the best overall performance, a helmet had to outperform the median results in both the shock absorption and oblique impact tests. In 2021, two adult helmets and two child helmets achieved the "Recommended" label[7,8].

Above all not all bike helmets are suitable for all types of bike riding, so you need to make sure you get the right helmet.

Fit

It is important to ensure your helmet fits your head properly. If a helmet is too small, it will sit too high and fail to protect the lower part of the head. If it is too big, the helmet will not be securely fitted to the head and could shift during a collision, exposing the head to potential injury.

When correctly fitted, the helmet should provide a snug yet comfortable feel. It should be securely positioned on the head without any movement. Here are some key guidelines for achieving a proper helmet fit:

1. Measure your head circumference, you should measure one or two finger widths above the eyebrows
2. The helmet should sit level on the head, neither tilting back nor forward. It should rest about one to two finger widths above the eyebrows
3. The retention system at the back of the helmet should be tightened. This system is typically adjusted using a dial ratchet or push-and-press mechanism
4. The helmet straps should be even and form a "V" shape under the earlobes. They should be snug

[4] Snell Foundation, Snell certified helmets; https://smf.org/cert: Accessed May 2023
[5] Dome Standards, Bicycle EN-1078; https://www.helmetfacts.com/standards/en-1078/: Accessed May 2023
[6] Folksam, 2019, Bicycle Helmets Tested by Folksam; https://nyhetsrum.folksam.se/sv/files/2019/06/S40150_Rapport_vuxen_ENG.pdf: Accessed May 2023
[7]Road Safety Trust, 2021, Cycle Helmet Safety Test Results, 2019, 2020, 2021; https://static1.squarespace.com/static/61d570b3a2957b5f755587d2/t/6203ba87963eef2d7af3473c/1644411527435/Adult%2Bcycle%2Bhelmet%2Bresults%2Btable%2B2021.pdf: Accessed May 2023
[8]Road Safety Trust, 2021, Child Cycle Helmet Safety Test Results 2021; https://static1.squarespace.com/static/61d570b3a2957b5f755587d2/t/6203ba9f957294560792b1dd/1644411552088/Child%2Bcycle%2Bhelmet%2Bresults%2Btable%2B2021.pdf: Accessed May 2023

and lay flat against the head

5. Once properly fastened, you should only be able to fit one or two fingers under the chin strap. When you open your mouth, you should feel the chin strap pulling the helmet onto your head.

By following these fitting instructions, you can ensure that your helmet provides the best possible protection while cycling.

Replacing your cycle helmet

Over time, your bike helmet will naturally deteriorate and require replacement, even if it hasn't been involved in any falls or crashes. The specific recommendations for replacement can vary, ranging from as early as three years to as long as ten years. This is primarily because various components of the helmet, such as the shell, retention system, and adhesives holding it together, can degrade and lose their effectiveness.

The EPS foam, which plays a crucial role in absorbing and dissipating impact energy, also undergoes gradual changes. Constant exposure to knocks, small bumps, and drops onto hard surfaces can cause the foam to lose its volume and, consequently, its ability to effectively protect against impacts[9].

Therefore, it is important to periodically evaluate the condition of your helmet, even if you haven't been involved in an accident. Take the time to visually inspect for any visible signs of damage, including but not limited to the straps, shell, and retention system. If you notice any significant wear, cracks, or other forms of damage, it is essential to replace your helmet[10].

The consumer funded Bicycle Helmet Safety Institute[11] has a few golden rules for when you should replace your helmet:

- Did you crash in it? **Replace it**
- Did you drop it hard enough to crack the foam? **Replace it**
- Is it from the 1970s? **Replace it**
- Is the outside just foam or cloth instead of plastic? **Replace it**
- Does it lack the safety stickers? **Replace it**
- Can you not adjust it to fit correctly? **Replace it**

The effectiveness of cycle helmets

[9] Off-road CC, When should you replace your bicycle helmet?; https://off.road.cc/content/feature/when-should-you-replace-your-bicycle-helmet-1280: Accessed May 2023

[10] GMBN, 2022, Five signs you need to replace your mountain bike helmet; https://www.youtube.com/watch?v=GEN4qo5PGtM: Accessed May 2023

[11] Bicycle Helmet Safety Institute (2022) ''When should I replace my helmet?; https://helmets.org/replace.htm: Accessed May 2023[12] Abderezaei Javid, Rezayaraghi Fargol, Kain Brigit, Menichetti Andrea, Kurt Mehmet, 2021, An Overview of the Effectiveness of Bicycle Helmet Designs in Impact Testing, Frontiers in Bioengineering and Biotechnology, V9, 2021 https://www.frontiersin.org/articles/10.3389/fbioe.2021.718407/full: Accessed May 2023

Although helmets cannot guarantee absolute prevention or complete reduction of head injuries in all circumstances, evidence suggests that they are effective in reducing the number and severity. The effectiveness of a helmet depends on various factors, including the type of collision the cyclist is involved in, the rider's injury tolerance, and the surface the helmet comes into contact with (such as a kerb or a car bonnet). In addition, various new cycle helmet technologies perform better than conventional helmets on impact[12].

Two meta-analysis studies have estimated the potential reduction in head injuries when wearing a cycle helmet. The first study analysed 40 case control studies, comparing 64,000 cycling collisions involving helmeted and non-helmeted individuals. It estimated that when wearing a helmet, the risk of severe head injury decreases by 69% and the risk of fatal head injury by 65%[13]. The second study, based on 55 studies, found that cycle helmets reduce the risk of death or serious injury by 34%, serious head injury by 60%, traumatic brain injury by 53%, and facial injuries by 23%. Building upon these findings, the Dutch Road Safety Research Foundation (SWOV) used the results to estimate that if all Dutch cyclists wore helmets, there would be 85 fewer fatalities per year[14].

These studies demonstrate the potential for helmets to significantly mitigate the risks associated with head injuries while cycling. However, it is important to acknowledge that individual scenarios may vary, and the effectiveness of a helmet can be influenced by various factors. Nonetheless, wearing a helmet remains a valuable safety measure for cyclists.

The effectiveness of cycle helmet legislation

Bicycle helmet laws vary across different countries, and their introduction is primarily motivated by the aim to increase helmet usage, reduce head injuries and fatalities, and minimise associated societal costs. Currently, a total of 28 countries have implemented some form of bicycle helmet legislation, with only two countries repealing such laws in the past 30 years[15].

Despite the evidence supporting the effectiveness of cycle helmets, some studies suggest that in areas where cycle helmets have been made compulsory, there has been a decline in cycling levels, thus, negating the potential health and environmental benefits.

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[12] Abderezaei Javid, Rezayaraghi Fargol, Kain Brigit, Menichetti Andrea, Kurt Mehmet, 2021, An Overview of the Effectiveness of Bicycle Helmet Designs in Impact Testing, Frontiers in Bioengineering and Biotechnology, V9, 2021 https://www.frontiersin.org/articles/10.3389/fbioe.2021.718407/full: Accessed May 2023

[13] Olivier, J, and Creighton, P., 2016, cited in SWOV (2017) 'Bicycle Helmets': https://www.swov.nl/en/facts-figures/factsheet/bicycle-helmets: Accessed May 2023

[14] Weijermars WAM, Boele-Vos MJ, Stipdonk HL, Commandeur JJF. Mogelijke slachtofferreductie door de fietshelm. https://www.swov.nl/publicatie/mogelijke-slachtofferreductie-door-de-fietshelm: Accessed May 2023

[15] Esmaeilikia, Mahsa & Grzebieta, Raphael & Olivier, Jake. (2018). A Systematic Review of Bicycle Helmet Laws Enacted Worldwide. 29. 30-38; https://www.researchgate.net/publication/327050885_A_Systematic_Review_of_Bicycle_Helmet_Laws_Enacted_Worldwide: Accessed May 2023

When helmet laws were initially implemented in Western Australia, there was evidence indicating a decrease in the number of cyclists [16]. However, subsequent factors such as rising fuel costs, the expansion of cycling infrastructure, and relaxed police enforcement of the legislation have contributed to a recovery in cycling rates. In fact, Australia's cycle 'boom' since 2000 is simply a reversing of a rapid downturn that occurred from 1990-2000[17]. Similar trends have been observed in other countries with bicycle helmet laws, where minimal or relaxed enforcement has allowed cycling levels to rebound. Conversely, in areas where helmet laws are strictly enforced by the police, cycling rates have remained low, particularly among children and for everyday commuting purposes[18].

These observations highlight the complex interplay between helmet legislation, cycling behaviour, and enforcement practices. It underscores the need for comprehensive analysis and a balanced approach when considering the implementation and enforcement of bicycle helmet laws, considering potential impacts on cycling participation, public health, and environmental considerations.

RoSPA's position

There continues to be much debate regarding the effectiveness of cycle helmets and whether the wearing of them should be made compulsory. RoSPA's position regarding this is that we strongly recommend that cyclists wear a cycle helmet, as it reduces the risk of suffering a serious head or brain injury in an accident. Cycle helmets do not prevent crashes from happening in the first place, nor guarantee survival, but they do provide a last line of defence for the cyclist's head.

RoSPA does not support calls for compulsory cycle helmet laws because it is not clear whether such a law would discourage some people from cycling, which, if it did, would mean losing the health and environmental benefits from cycling. By deterring people from cycling, this may also reduce the benefits that cyclists gain from 'safety in numbers'[19]. For more information on the safety in numbers, read our factsheet.

If we are to make cycling safer, it is vital that drivers and cyclists share the road space and that drivers have a greater appreciation of their vulnerability. Cyclists are most likely to be injured at junctions, roundabouts, where the road narrows (pinch points) and near left turning HGVs.

Helmets do have a role to play, however they must be regarded as a secondary safety feature. Preventing the collision happening in the first place should be paramount.

[16] Robinson, DL, 2006, Do enforced bicycle helmet laws improve public health? BMJ 2006; 332; 722; http://www.cycle-helmets.com/robinson-bmj.pdf: Accessed May 2023

[17] Gillham, C Mandatory bicycle helmet law in Western Australia; http://www.cycle-helmets.com/bicycle_numbers.html: Accessed May 2023

[18] McDermott (1993) cited in Olivier, J. and Creighton, P. (2016) 'Bicycle injuries and helmet use: a systematic review and meta-analysis', International Journal of Epidemiology, 1:1-15.

[19] Jacobson, PL, 2004, Safety in numbers: more walkers and bicyclists, safer walking and bicycling, Injury Prevention, 2004, V9 Issue 3; https://injuryprevention.bmj.com/content/9/3/205: Accessed May 2023