



## Article

# Analysis of Occupational Accidents in Tree Climbers

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**Abstract:** The work of tree climbers is a hazardous activity during which many risks of occupational accidents must be faced. Numerous injuries happen during the performance of this professional activity. This is why our research was conducted, and the principle of which was to gather and evaluate, on the basis of the questionnaire method, injuries occurring to tree climbers during their work. An anonymous online questionnaire was prepared in order to obtain data about the rate of accidents recorded amongst tree climbers working in the territory of the Czech Republic. There were 121 tree climbers participating in the collection of data. The questionnaire was divided into seven sections, each section including questions focused on possible injuries related to the work of tree climbers and first aid. Answers of respondents indicated that the highest number of injuries were caused by cutting with the manual saw. Burns caused by the power saw and damage to eyes by sawdust or dust during sawing followed. The results also showed that nearly 30% of tree climbers work alone, and 47% of tree climbers collaborate with a ground worker who is not able to rescue them from the tree in the case of an exceptional unexpected situation. The research also revealed surprising results as to carrying first aid kits. Only 62% of tree climbers have a personal first aid kit on them in the tree crown. However, a positive finding appears in the fact that 75% of tree climbers are graduates of some medical course.

**Keywords:** arboriculture; tree climbing; accident; injury; occupational health and safety; urban forestry



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## 1. Introduction

Trees play a very important role in the urban environment. We can see them in parks, street alleys, solitary standing, or as a part of urban forests. Particularly trees in towns are exposed to many unfavorable factors affecting their safety. The impact of these factors on the tree health is considerably influenced by the predisposition of trees to various stresses, type, severity and duration of the stress, tree age, and initial health condition (vitality) [1]. Also, the trees are usually planted on sites that are not ideal for their growth (e.g., roadsides, town parks, recreational zones etc.) and are susceptible, among other things, to diseases related to their vitality [2]. Furthermore, the presence of trees in towns, including alleys or private gardens, is considered necessary for the general welfare of both individuals and society [3], and they are considered a key component of town sustainability [4]. This, however, brings responsibilities to take care of these tree species as all trees occurring near people and property represent a certain risk in case of their complete or partial failure [5].

Arboriculture is an increasingly important topic and profession, namely as far as trees in big towns and cities are concerned [6] where they have to be looked after and maintained due to their strategic role, for example, in combating climate change and improvement of living conditions for inhabitants of towns [7]. Trees grown in the urban environment require regular pruning to resolve a number of problems—to ensure proper visibility, public security or patency of electrical wiring [8,9]. Last but not least, owners of trees are obliged to ensure their security, which is imposed by civil and criminal laws. They have to maintain the trees in a good state to prevent predictable injuries, accidents, or damage to property [10]. Particularly in legal issues related to accidents caused by trees [11], the

owner has to consider the risks represented by his/her/their trees [12] and try to minimize the risks.

Tree climbers are exposed to various occupational risks; therefore, they have to master a sophisticated set of skills in order to reduce the probability of accidents in the workplace [13]. The trees have to be treated by experts as they are familiar with the biology of plants as well as with reactions of various types of cuts on the tree in dependence on its species and age [14]. In addition, these experts must be familiar with work procedures for pruning, trimming, and other treatments to be able to work efficiently and safely [15,16] and to provide for the protection of all workers doing the job [7]. The work of arborists (tree climbers) ranks among the hazardous profession. [13,17–19]. Arborist tree climbing is also physically demanding and needs muscular and cardiovascular fitness [20].

Rope access methods are techniques increasingly used by professional arborists in the maintenance of trees occurring in urban areas. The techniques are used for diverse operations such as pruning, felling of trees, cabling etc. [7]. Tree climbing using the cable technique is a hazardous activity by itself, the reason being height and the risk of fall [6]. Many a time, however, it is the only possible solution for the maintenance of trees [7]. The type of work allows arborists to move within the tree crown and to reach target branches [6], selective and targeted measures in the tree crowns, reaching the internal tree crown parts without damage to other trees, and access to trees in difficult-to-access areas [21]. Tree climbers work at heights and use dangerous sharp tools such as handsaws, chain saws, and pole saws to carry out hazardous tasks such as pruning or removal of tree branches [19]. If they are not careful enough, the sharp tools can easily cut the tree climbing equipment or even a part of their body [17].

Working at heights brings the danger of falling. Namely, falls from height represent about a third of all fatal occupational accidents of tree climbers [22–24]. Marshall et al. [25] found that 104 of 698 accidents (15%) related to trees (during tree climbing) 3 years after the Sandy hurricane in New Jersey, USA, were caused by falls. As mentioned above, arboriculture is a hazardous profession with a high rate of serious accidents and deaths. In the USA, for example, the annual mortality of persons working on trees is permanently 30.0 per 100,000, which is almost eight times more than the national average of 4.0 deaths per 100,000 persons working in all other industries [22,26,27]. In Australia, tree climbers exhibited the highest mortality of all industrial branches—42 deaths per 100,000 persons, which was 28 times more than the average mortality of industrial workers [28]. In the UK, the rate of accidents happening to tree climbers in 2005–2010 was 83 per 1000 persons, and 34 deaths of tree climbers were recorded in 2002–2012 [29]. Research conducted by Castillo and Menendez [24] in the USA in 1992–2007 revealed that in 1285 fatalities of tree climbers, 44% happened during the pruning of trees, 34% were related to the fall from the tree, and 14% had to do with the electric shock.

The risk of accidents in the work of tree climbers can be reduced by e.g., efficient training, proper selection, and use of personal protective equipment or hazard recognition and control [30,31]. Regarding hazards of the work of tree climbers, persons performing the job also have to be familiar with the safety standards in arboriculture as nearly all of them contain parts focusing on safe methods of tree climbing [18].

The goal of this research was to identify the most frequent occupational accidents of tree climbers from the Czech Republic and to highlight the causes of those accidents. The authors worked with a hypothesis that the highest number of accidents would happen during gradual felling or working with the power saw. They expected the highest number of repeatedly occurring injuries in the form of cuts and burns by individual parts of the power saw.

## 2. Materials and Methods

In order to obtain data on the accident rate recorded in Czech tree climbers, an anonymous questionnaire was prepared in Google Forms software with questions to be answered by respondents. The questionnaire contained 20 questions, of which a majority

(14) were to be answered YES/NO. The remaining questions (6) were open-ended, i.e., the respondents were to write their answers. After the first testing, the duration of time reserved for filling the questionnaire was 7 min. The respondents were given the right to refrain from answering some questions as none of them were obligatory. Within ethics, the respondents were, prior to filling the questionnaire, informed in writing about the guaranteed anonymity of their answers as well as about the intention of authors to process and publish their answers to questions in the questionnaire.

The questionnaire was divided into 7 sections. Section 1 was focused on general information about the respondents. Sections 2, 3, and 4 dealt with the issue of injuries happening to the tree climbers during the performance of the most hazardous types of their work activities—Injuries associated with the tree felling; Injuries associated with the power saw operation; Injuries associated with working in the tree crown. In section 5, the respondents answered questions concerning injuries caused by external factors (stinging insects, electric lines, injuries due to weather impacts)—Injuries caused by external impacts. Section 6 was devoted to first aid kits at the workplace and first aid—First aid kits and first aid. In the final section 7 (Summary of injuries happening repeatedly), the respondents were given a chance to characterize injuries that happened to them repeatedly during their work as tree climbers.

The collection of data from 121 respondents (119 males and 2 females) started on 10 November 2021 and lasted until 14 December 2021. The respondents were aged 20–57 years (the average age was 34 years). Most of them were aged 30–39 years (45.5%), then 20–29 years (29.8%), 40–49 years (18.2%), and 50–57 years (6.5%). The respondents were also asked at what age they started working as tree climbers, and their practice in tree climbing was calculated, which was taken into account in some results.

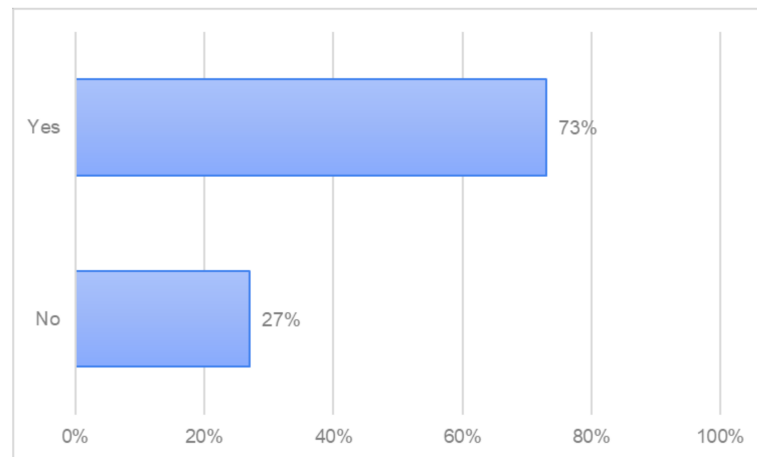
When the survey was over, the data were generated from the Google Forms software into the Microsoft Excel programme and then divided into individual sheets based on the respective sections of questions. The resulting data in these sheets were allocated order numbers according to the date of mailing by the respondents. Answers to closed-end questions were processed by filtering the necessary areas, i.e., using either filters of numbers or filters of text. The answers to the open-end questions were evaluated separately, each according to the evaluation of respondents themselves as their answers differed. Individual values of all answers were summed up and recorded into tables from which then graphs were plotted.

The values of graphs were at all times expressed by the number of answers to specific questions and converted to percentages that were rounded to integers. The graphs illustrate percentage shares of the values of answers from the individual respondents.

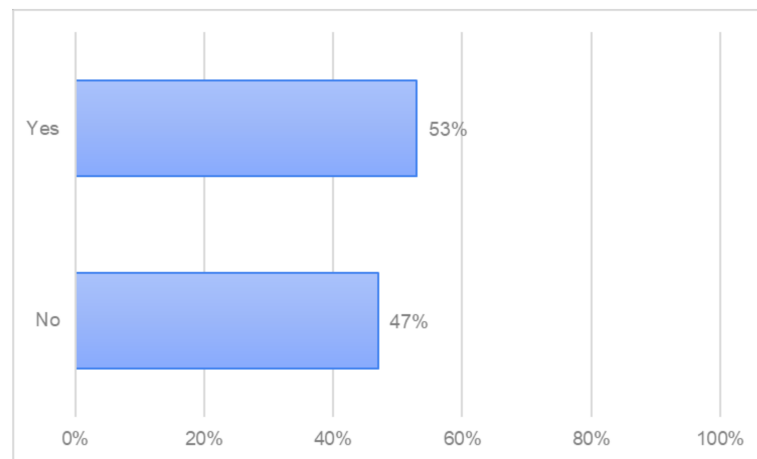
### 3. Results

Figure 1 shows respondents' answers to the question "Do you always work min. in pairs?". The results indicate that a majority of respondents (88, i.e., 73%) work at all times minimally in pairs. Nevertheless, the fact that the remaining 33 of the addressed tree climbers work alone is alarming. Most of these 33 tree climbers (32) work as freelancers, and one of them was employed by an arborist firm. A majority of tree climbers working alone were recorded in the age category of 30–39 years (42%).

Figure 2 illustrates the results of answers to the question "Is your ground colleague able to rescue you from the tree in the case of your injury?". Answers to this question showed that a slightly over-half majority of tree climbers (53%) work with ground colleagues who are capable of rescuing them from the tree. Based on answers to this question, it can be stated that only 63% of the total number of 88 tree climbers working minimally in a pair had a ground colleague who could save them from the tree if necessary.



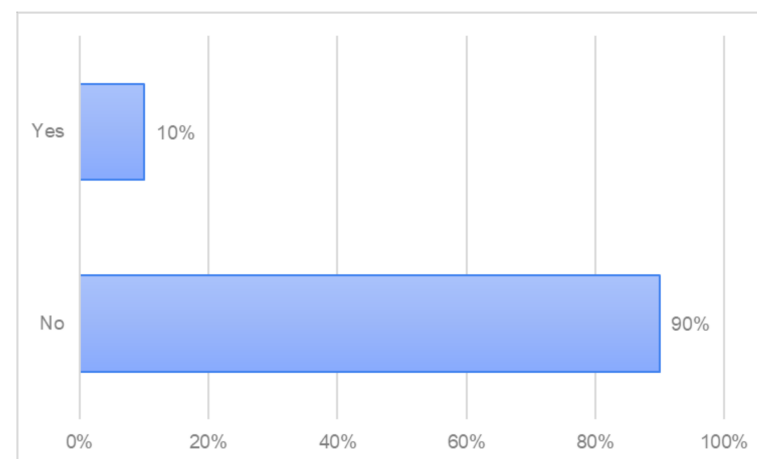
**Figure 1.** The number of tree climbers working minimally in a pair.



**Figure 2.** Qualifications of ground workers.

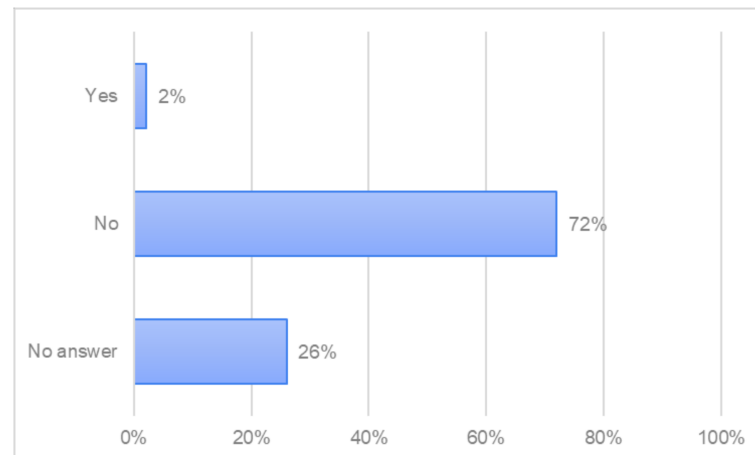
### 3.1. Injuries Associated with the Tree Felling

The question “Have you ever suffered an injury in wedging the rope?” (Figure 3) was answered NO by 109 (90%) of respondents and YES only by 10% of respondents, which is a very good result if we take into consideration risks associated with this technique of tree felling.



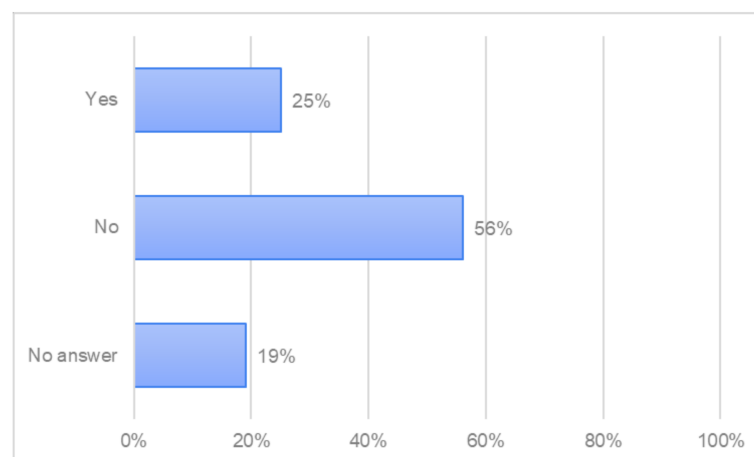
**Figure 3.** Rate of injuries caused by rope wedging.

The question “Have you caused yourself an injury by accidental cutting of safety rope or stem loop? If so, how did it happen?”. Figure 4 shows that 72% of respondents did not have such an injury. Only 2 of the respondents gave a positive answer. The first of them admitted a fall from about 4 m at the time when he was beginning to work as a tree climber. The second one mentioned a light injury by a broken branch hitting his chest due to the cut rope. The question was not answered by 26% of respondents.



**Figure 4.** Summary of injuries at the accidental cutting of safety rope or stem-loop.

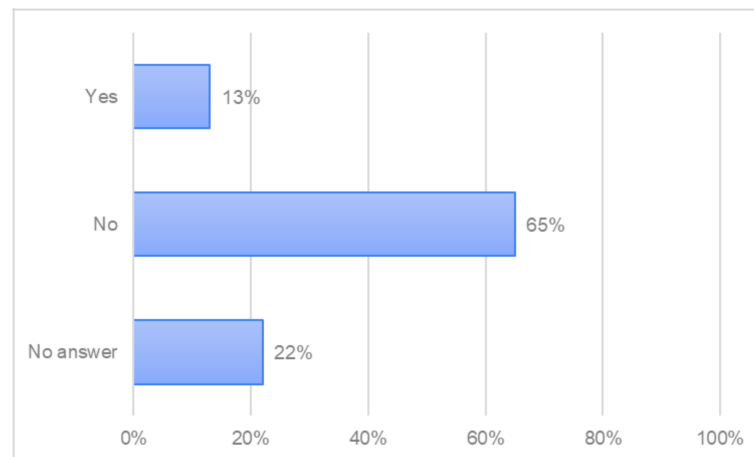
The question “Have you ever been hurt by the cut piece of wood at gradual felling? If so, what injury did you suffer?” was not answered by 19% of respondents who, however, answered the other questions in the questionnaire. Figure 5 shows that 25% of tree climbers who answered the question suffered an injury in this activity, most frequently small bruises, contusions, scrapes or effusions. More serious injuries were fractures, cut finger on the hand, broken finger on the leg, cut knee, damage to intercostal cartilage, and nasal injury.



**Figure 5.** Summary of injuries at gradual felling.

Figure 6 illustrates the answers of respondents to the question, “Have you ever hurt some of your colleagues at felling? If so, what was the cause?”. The question was answered by 94 of the total respondents. Only 13% of them admitted to having caused an injury to some of their colleagues. A clear cause appeared to be mutual inattention or disobeying a warning. Some respondents mentioned even specific injuries caused to their colleagues such as stabs by climbing irons, injuries caused by the falling cut branch, injury by power saw, damage to eyes by sawdust, but also haste, poor estimation, and specific injuries

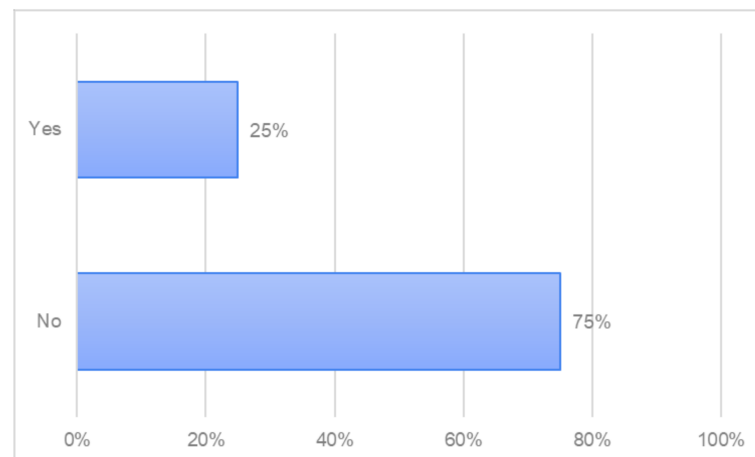
caused to their colleagues, such as lack of attention, and carelessness or non-respecting the closed space.



**Figure 6.** Summary of injuries to colleagues.

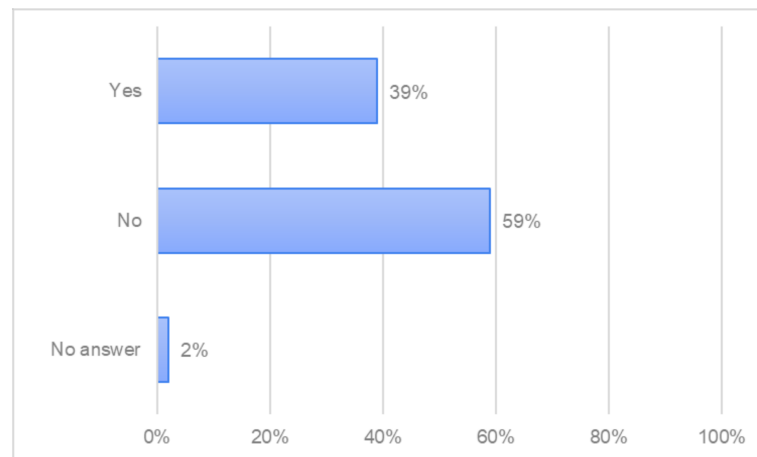
### 3.2. Injuries Associated with the Power Saw Operation

Answers to the question “Have you ever hurt yourself with the power saw at pruning or felling?” (Figure 7) indicate that a quarter of respondents suffered injuries caused by the power saw during the performance of all operations of gradual felling (including removal of branches). In 87% of cases, tree climbers suffering an injury were working with the petrol power saw. The remaining ones had the accumulator power saw.



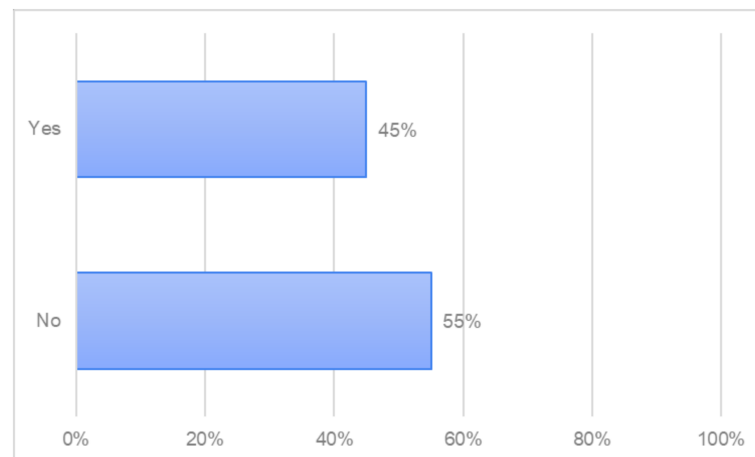
**Figure 7.** Summary of injuries caused by a power saw at pruning or felling of trees.

Answers to the question “Have the sawdust, dust and other dirt caused you any harm during the power saw operation?” represented the second most frequently occurring case of injuries happening during the power saw operation. Specifically, 39% of addressed tree climbers damaged their sight when working with the power saw (Figure 8). The fact was rather surprising as it suggests that not all tree climbers use eye protection when working with the power saw or that not always the eye protection functions correctly.



**Figure 8.** Summary of damage to the sight of tree climbers at working with the power saw.

Figure 9 presents a summary of answers to the question, “Have you ever got burned yourself on the power saw exhaust or hot oil?”. As shown, 45% of tree climbers participating in this survey suffered injuries in the form of burns from the power saw. This type of injury appeared to be the most frequent one in power saw operations.



**Figure 9.** Frequency of burns from the power saw in tree climbers.

### 3.3. Injuries Associated with Working in the Tree Crown

Answers to the question “Have you ever experienced an occupational accident due to broken branch?” indicate that more than a quarter of respondents experienced an injury due to a broken branch (Figure 10).

Figure 11 brings a comparison of answers to two questions: “Have you ever cut yourself with the power saw in the tree crown?” and “Have you ever cut yourself with the manual saw in the tree crown?”. The results show (Figure 11) that more accidents happen when the tree climbers choose manual saw. The number of tree climbers who cut themselves with the power saw was 66% lower than the number of those that were cut with the manual saw. The number of tree climbers who did not cut themselves with the manual saw was 71.9% lower than the number of those who did not obtain cuts with the power saw. Of the total number of respondents, 26% informed that they experienced a cut injury by both the power saw and the hand saw.

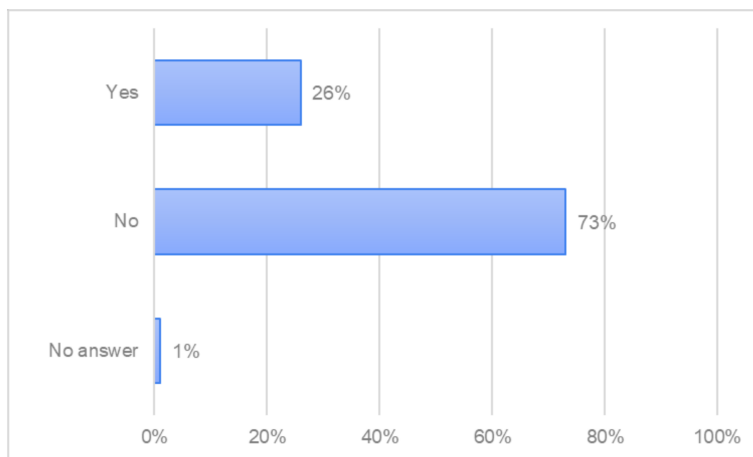


Figure 10. Frequency of injuries to tree climbers due to broken branch.

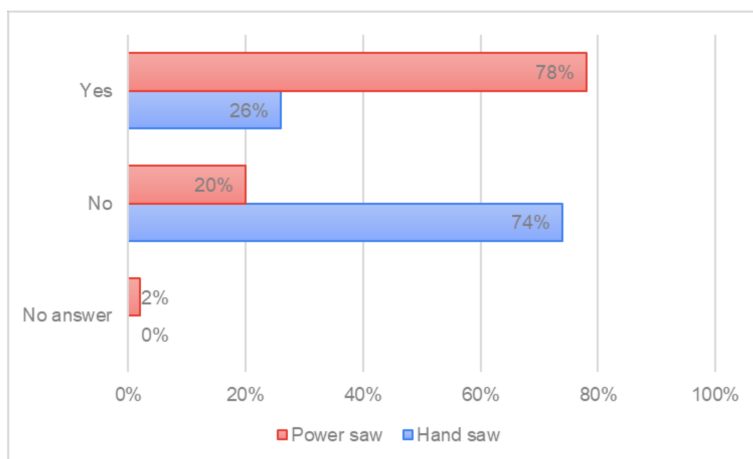
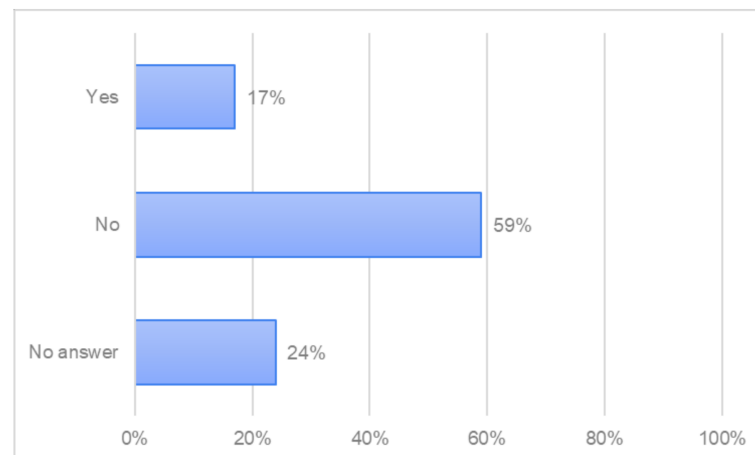


Figure 11. Comparison of the frequency of injuries by the power saw and hand saw.

The question “Have you ever experienced an accident when climbing/descending to/from the tree crown? If so, what was the cause?” was answered by 92 respondents (Figure 12). Accidents associated with this activity happened to 17% of them. Apart from injuries by a manual saw, stinging insects, cut injury by dry or broken branches, respondents also mentioned the fall of a whole tree (followed by free fall), poor knotting, loose rope, non-concentration, impetuosity, poor visualization of the surrounding environment, body fatigue, finger contused from the positioning system, burned fingers after fast abseiling or after controlling the descent brake by one hand. One of the causes of an accident was testing a new element of the tree climbing equipment when the respondent intentionally jumped by free fall from a height of 8 m to test its efficiency and fell down on the ground due to poor security.

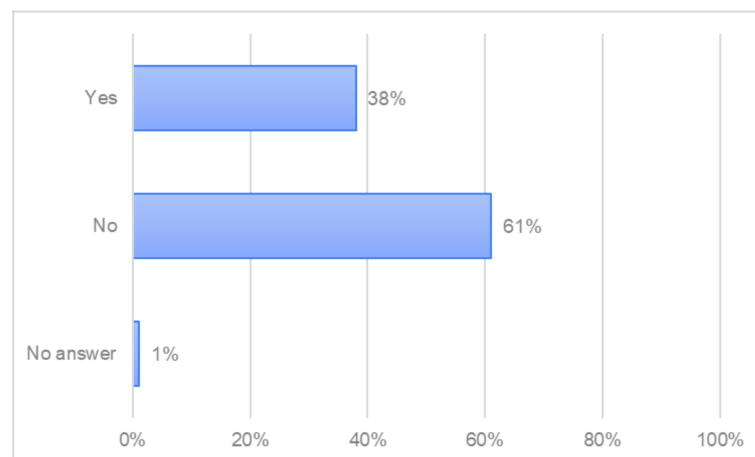




**Figure 12.** Summary of accidents to tree climbers at climbing/descending from the tree crown.

### 3.4. Injuries Caused by External Impacts

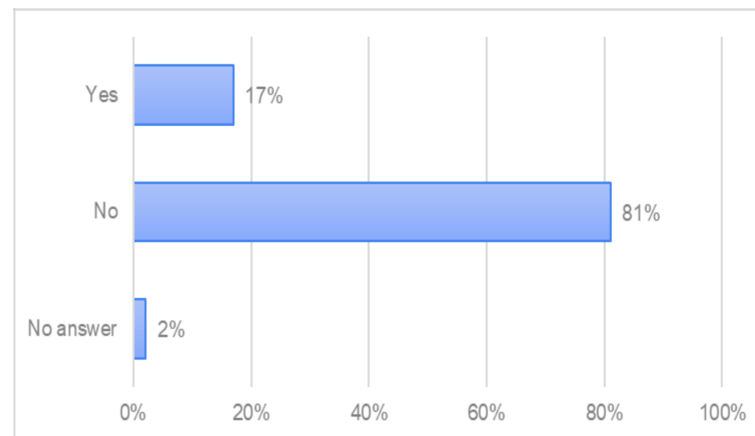
The question “Have you ever experienced an occupational accident caused by stinging insect?” (Figure 13) was answered negatively by most respondents (61%). It should be mentioned here, and the question was included in the questionnaire, too, that 74% of addressed tree climbers did not have any protection against the stinging insects in their equipment (repellents, insect masks etc.).



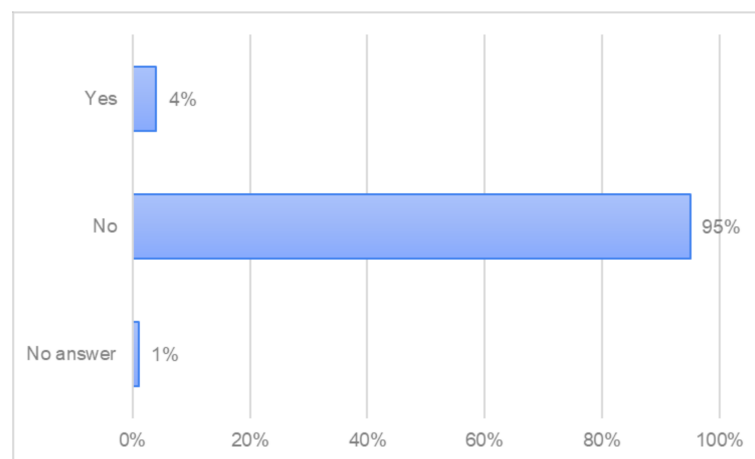
**Figure 13.** Summary of injuries to tree climbers caused by stinging insects.

Answers to the question “Have you ever experienced an occupational accident caused by a sudden gust of wind, wind storm, moist or wet branches?” indicated that abiotic agents do not cause frequent accidents to professional tree climbers; only 17% of them mentioned such an accident, while 81% did not (Figure 14).

Figure 15 presents a clear result of answers to the question, “Have you ever experienced an incident with electric line when working in the tree, which ended as injury?”. It should be pointed out here that electric shock is still a serious threat to all tree climbers that must not be underestimated.



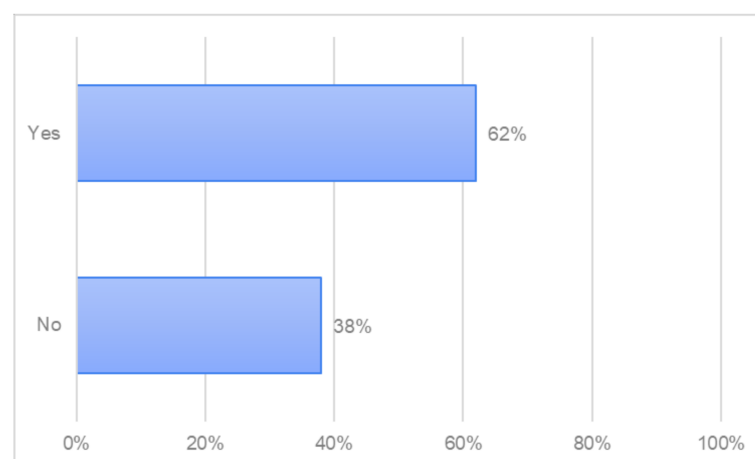
**Figure 14.** Injuries caused by some abiotic factors.



**Figure 15.** Summary of injuries that happened to tree climbers due to the incident with electric line.

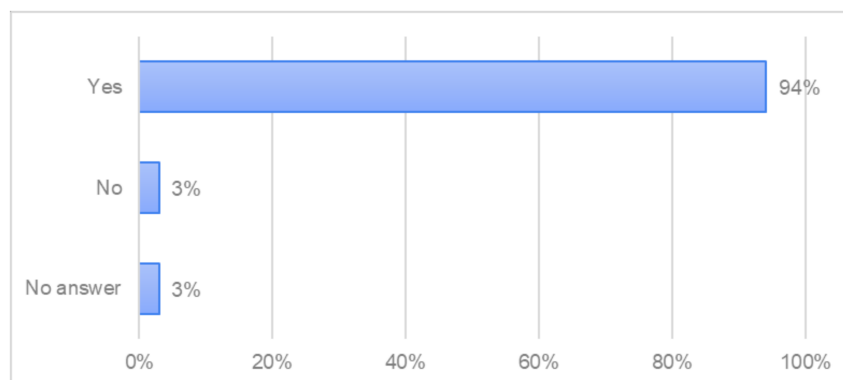
### 3.5. First Aid Kit and First Aid

The question “Do you have your personal first aid kit on you when working on the tree?” was answered positively only by 62% of respondents (Figure 16). It is a rather alarming result when more than a third of tree climbers do not have a first aid kit which is intended for acute treatment at work on the tree.



**Figure 16.** Tree climbers with/without the first aid kit at work on the tree.

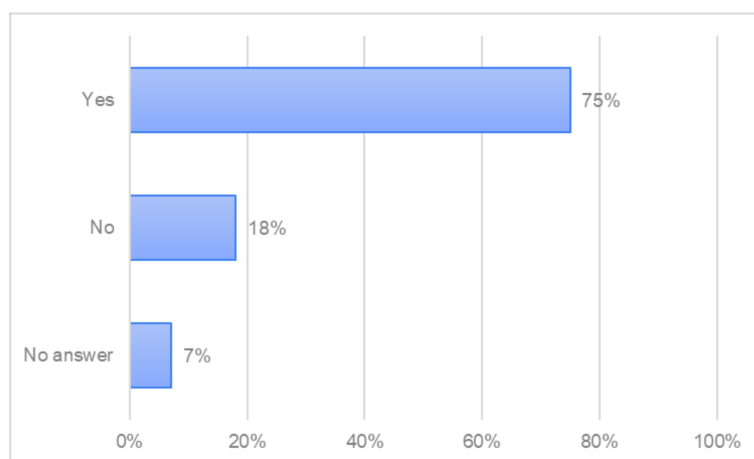
The share of tree climbers with the first aid kit at the ground workplace is shown in Figure 17. It follows from Figure 17 that 94% of addressed tree climbers have a first aid kit at their ground workplace and are prepared for emergencies. However, in 62% of cases, the first aid kit was kept in the car, which may be a considerable risk when rapid medical assistance is needed. In the other cases, the tree climbers keep the first aid kit near the tree they work on (together with the other tree climbing equipment). The results also confirmed that 93% of tree climbers who have a personal first aid kit on them when working in the tree crown have also a first aid kit at the ground workplace.



**Figure 17.** First aid kit at the ground workplace.

Relatively satisfactory results were recorded in the question “Have you completed any medical course? Which?” as 75% of addressed professional tree climbers completed the first aid course (Figure 18). Of these, the authors singled out 69 tree climbers who specified the type of such a course (or organizations holding them). Basic first aid courses in more closely specified organizations were completed by the highest number of tree climbers (38%). Other 22% of respondents participated in the course of the first aid and rescue for tree climbers, organized e.g., by SZKT (Society for gardening and landscaping) or within the ČCA (Czech certified arborist) certification. 16% of respondents completed courses organized by professional or voluntary firemen. First aid courses held by the Czech Red Cross were completed by 9% of tree climbers. First aid courses during the study at secondary schools or universities were completed by 4% of respondents. Other first aid courses completed by tree climbers participating in our research included a course during civil service at hospital, military medical courses, in-house courses held by various companies, and a course for emergency medical technicians.

The question was answered by 93% of respondents.



**Figure 18.** Tree climbers with the completed medical course.

### 3.6. Summary of Injuries Happening Repeatedly

The last question, “Make a list of injuries that happened to you repeatedly” was answered by 69% of respondents, of whom 89% stated that some injuries happened to them repeatedly. The goal of this question was to warn about specific repeatedly occurring injuries. Some respondents mentioned more injuries that happened to them repeatedly; this is why the following list of repeated injuries does not total 100%.

Most injuries that happened repeatedly to the tree climbers (59%) were cuts by hand saw. 20% of tree climbers informed that their repeated injuries were contusions and scrapes. Damage to sight (from sawdust and dust) was repeatedly suffered by 15% of tree climbers. In 7% of cases, tree climbers suffered repeated injuries due to cutting on the power saw, and 4% of tree climbers experienced repeatedly a fracture. Additionally, 3% of repeated injuries to the tree climbers were burns by a power saw and injuries caused by stinging insects. Other, less frequent accidents repeatedly happening to the tree climbers included falls from the tree, knocked out teeth, head injuries or bumps.

## 4. Discussion

The aim of this research was to identify the most frequent injuries happening to tree climbers during the performance of their work and to highlight hazards associated with their profession. This was the reason why the questions in the questionnaire determined for professional tree climbers were formulated towards the most hazardous activities performed by them. As no such research focused on a detailed analysis of causes of accidents to tree climbers has been conducted so far, the following section is devoted to the issue of general injuries recorded in tree climbers and their possible prevention.

The basic principle of working in the tree crown is not to work alone. Ground colleagues of tree climbers must always be properly trained for the case of necessary first aid and rescue of their colleague tree climber from the tree crown. The tree climbers have to be trained, too, because the risk of accidents and physical load needs to be reduced during the tree treatment and pruning [32–34]. Julius et al. [13] hold the view that the understanding of factors affecting safety procedures in workers taking care of trees is important to prevent injuries. Considerable educational resources and equipment are available to prevent injuries caused, e.g., by power saws [35]. Robb et al. [36] claim that wider implementation of the combined training (in the safety of using power saws) and collaboration (including supervision at the workplace) contributed to a significant reduction in accidents. Dozier and Machtmes [37], who conducted a survey among arborists in Louisiana, agree that professionalism and safety are closely related. Burke et al. [38] evaluated 95 studies across various professions and industries. They found out that all methods of training improved the performance of workers in safe behavior, with the performance being somewhat better with the most engaging training methods. Ball and Vosberg [27] conducted research in which they found out that although 88% of managers in companies taking care of trees considered it very important to have trained workers, only 62% stated that their company has a formal training programme and only 72% of these companies trained workers before the performance of work activity.

Personal protective work equipment is one of the factors which can reduce the risk of accidents, which the tree climbers should use correctly at work. However, Julius et al. [13] claim that most employees of tree care companies normally do not use the recommended personal protective equipment.

The authors assumed in this research that most injuries caused by power saw would be cuts. However, the results clearly showed that the addressed tree climbers considered the most frequently occurring injuries by a power saw to be associated with burns and dust in the eyes. According to [29], power saw operators in Great Britain agree that the most frequent cause of injury by power saw is usually wrong position at work (or bad saw grip), time stress or fatigue, and loss of concentration [29].

Searching for a correct position when cutting in the tree crown is many a time difficult for tree climbers, and this is why they try to make their job easier. In practice, the tree

climber holds the power saw with one hand only or makes the cut with an obscured view of the notch. The risk of this operation does not need to be only cutting but also injuries associated with burns by the power saw or sawdust in the face during cutting. According to [39], a correct solution in this situation is to find a suitable work position with a sufficient view or to try a so-called cut in rough.

The degree of the risk of injury in tree climbers can also be influenced by the fact that the tree climbers can choose diverse systems of climbing into the tree crown depending on their personal preferences and work to be done [19] as there are many equipment's and tools allowing safe ascent and comfortable movement in the tree crown [13]. Grindle et al. [40] state that discomfort at safe work often causes hazardous behavior in workers.

This research demonstrated that the most frequent injury in the tree crown was cut by the hand saw. Causes may be several, e.g., bad technique of sawing, wrong grip on the handle, underestimated output of the saw, blunt saw blade or again a wrong work position mentioned by [39]. Thus, it follows that tree climbing should also include the safe use of cutting tools (hand saw and power saw) by tree climbers who many a time climb to considerable heights. This is why they use ropes, slings, connectors, descenders etc. [7], and the equipment may not have ergonomic properties sometimes [41]. Some authors mention that in spite of all this security assuring equipment, tree climbers are still exposed to many risks, and tree climbing is a hazardous activity during which high numbers of accidents are recorded in many countries every year [3,42,43]. Examples are studies that primarily documented injuries of tree climbers [22,24,44] and surveys focused on circumstances of the deaths of persons associated with tree care [22,24].

According to information provided by the [45], persons working on trees suffered severe injuries during tree care and related operations. Many workers had to seek medical treatment in connection with injuries caused by power saws (used primarily for cutting trees and branches) [46]. There is also a study showing that a considerable risk of accidents and a high rate of deaths at work [22,47] are connected with tree care, pruning, and removal of trees. Several studies were focused on the load for rigging [42,43], using a speed line [48], ascents, descents, and falls [49], and on safety aspects connected with arborist tools [50,51].

Ball et al. [52] revealed that about a third of 56 fatal and non-fatal accidents included the failure of the primary support point (PSP) during ascent. Cetrangolo et al. [53] specify that the probability of PSP failure depends on its carrying capacity and the load to be carried when the tree climber climbs the tree, works in the tree crown, and then descends from the tree crown. Ref. [54] adds that recurrent loads connected with climbing the rope are caused by forces developed by the arborist's arms and legs. Load magnitude is an important factor in assessing the probability of PSP failure during ascent [53]. Ref. [19] claims that different actions during the performance of the same task but with the use of different climbing systems can change forces in various parts of the climbing system. According to Kane et al. [55], tree climbing is a dynamic process; thus, the load on the tie-in point (TIP) is also affected by the properties of the tree that is climbed. Reiland et al. [56] point out that in broadleaves, the seasonal presence or absence of leaves essentially affects tree dynamics, specifically by the frequency of tree swaying and tilting of the tree crown. Another risk that may lead to an accident is a wrong choice of branch size, which can be a securing point for the tree climber. As such, [57] remarks that branch diameter is a measure that can be easily estimated by tree climbers. However, the accuracy of such estimates probably differs with respect to the skills, training, and experience of tree climbers.

Results gained in this research also showed that 81.8% of addressed tree climbers work as freelancers. Robb and Cocking [29] inform that in recent years, 52% of persons felling trees were freelancers in the UK. In Slovakia, power saw operators working as freelancers represent a majority. Our research also revealed that 97% of tree climbers working alone are freelancers. Robb and Cocking [29] point to the fact that reporting occupational accidents is often incomplete or missing because of freelance tree climbers.

## 5. Conclusions

Based on the results of our research, the respondents caused themselves the highest number of injuries by the hand saw (78%), which were followed by burns caused by the power saw (45%), damage to sight (39%), and wounds caused by stinging insects (38%). The authors expected that most accidents would be caused at gradual felling or during the power saw operation. It follows from the results that the initial hypothesis of the authors was disproved. Nevertheless, the hypothesis concerning accidents that happened to the tree climbers repeatedly was partly confirmed (high frequency of cut injuries caused by the hand saw).

The results showed that nearly 30% of tree climbers work alone, and 53% of tree climbers have a ground colleague who is able to rescue them from the tree in case of emergency.

Surprising results were recorded in the section focused on first aid. Only 62% of tree climbers have a personal first aid kit on them in the tree crown, which is a tremendous hazard for the person. However, the finding that 75% of respondents completed a medical course appears rather positive.

There are several considerations following the survey. At the training in occupational health and safety, tree climbers should become more familiar with the issue and use of hand saws which, as demonstrated, cause numerous injuries to the Czech tree climbers. Tree climbers should also be informed and instructed that their work activities ought to always be performed in a team of two workers at a minimum and that the first aid kit ought to be brought with them into the tree crown for the case of emergency. Tree climbers should also wear recommended personal protective equipment during work.

There is a huge amount of risks in tree climbing; therefore, further research should be conducted in the future that would be focused, for example, on the psychological aspects, maintaining the right lifestyle of tree climbers, the impact of dehydration or warming of the organism when working in the tree crown etc. as it is one of the methods of informing the tree climbers, and to warn them against possible risks and accidents.

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