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Original Article

Safety Knowledge and Changing Behavior in Agricultural Workers: an Assessment Model Applied in Central Italy

Massimo Cecchini [1,*], Roberto Bedini [1], Davide Mosetti [1], Sonia Marino [2], Serenella Stasi [3]

[1] Department of Agriculture and Forestry Sciences, University of Tuscia, Viterbo, Italy
[2] Integronomia – Ergonomics and Sustainability Research, Rome, Italy
[3] Confedertecnica Advisor, Partner LVD Laboratory Democratic Evaluation, Rome, Italy

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ABSTRACT

Background: In recent years, the interest in health and safety in the workplace has increased. Agriculture is one of the human work activities with the highest risk indexes. Studies on risk perception of agricultural workers are often referred to as specific risk factors (especially pesticides), but the risk perception plays an important role in preventing every kind of accident and occupational disease.
Methods: The aim of this research is to test a new method for understanding the relation between risk perception among farmers and the main risk factors to which they are exposed. A secondary aim is to investigate the influence of training in risk perception in agriculture. The data collection was realized using a questionnaire designed to investigate the risk perception; the questionnaire was given to a sample of 119 agricultural workers in central Italy. Through the use of the "principal components analysis" it was possible to highlight and verify the latent dimensions underlying the collected data in comparison with scales of attitudes.
Results: Results show that the highest percentage of strong negative attitude is among the people who have worked for more years, while farmers who have worked for fewer years have a marked positive attitude.
Conclusion: The analysis of the questionnaires through the synthetic index method (Rizzi index) showed that agricultural workers involved, in particular the elderly workers, have a negative attitude towards safety; workers are hostile to safety measures if they have not attended special training courses.

1. Introduction

Risk assessment is at the foundation of safety management in the workplace. In the European Union (EU), risk assessment is mandatory for all companies according to the "European Framework Directive 89/391/EEC on safety and health of workers" (adopted in 1989). This directive is a milestone in the improvement of health and safety in workplaces. It guarantees minimum requirements for health and safety throughout Europe, although Member States are authorized to maintain or establish more stringent measures [1].

The risk assessment is a key feature as specified in several aspects of the Directive, such as: identification of risks, worker participation, development of suitable measures having as a priority the elimination of risks' sources, documentation, and periodic audit of risks in workplaces [2–10].

Since the risk assessment is carried out by people with different backgrounds and culture, it is substantially influenced by the individual's own perceptions of risk.

Workers are requested to apply the rules and corporate policy of health and safety at work, recognizing the dangers and the "relative risk values". The effectiveness of accident prevention is strictly dependent on the subjective perception of risk.

One of the areas under investigation is agriculture, often characterized by the use of a workforce that is low-skilled and of different cultural and geographical background, and with a frequent use of seasonal workers.

In this regard, for example, the agricultural sector of Lazio (Central Italy) employs approximately 305,000 people, of which about 13,000 are foreigners (6,500 from EU countries, 6,800 from outside the EU), and with respect to the grade of education, most of the operators have attended primary and middle school (Fig. 1).

* Corresponding author. Department of Agriculture and Forestry Sciences, University of Tuscia, Via S. Camillo De Lellis snc, 01100, Viterbo, Italy.
E-mail address: cecchini@unitus.it (M. Cecchini).

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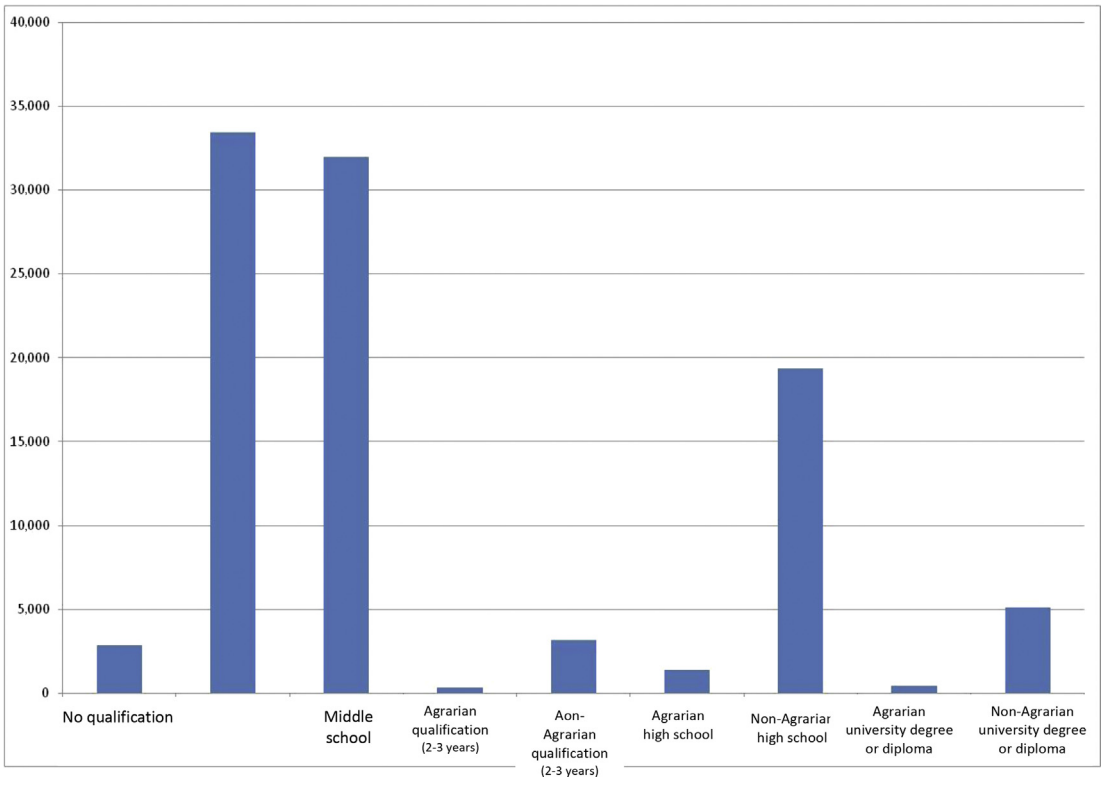

Fig. 1. Qualification of the farm managers – data from Lazio region - (Agriculture Census 2010, ISTAT).

The purpose of this work is to understand the relationship between risk perception among farmers and the main risk factors to which they are exposed; the work also investigates how health and safety training can influence the risk perception in agriculture. The data collection was realized through a questionnaire designed to investigate the risk perception; the questionnaire was compiled by a sample of 119 agricultural workers in central Italy.

Agriculture, together with construction, has the highest rate of accidents across all industries and is one of the high risk sectors.

In 2011 in the European agricultural sector (including: agriculture, forestry, and fishing), 165,000 cases of injury were estimated. Germany has a record of accidents with more than 66,000 cases, followed by Italy with almost 40,000 cases, respectively, 40% and 25% of the EU (data referred to the 28 states) [11].

In Italy (the country in which this survey was conducted) accidents in agriculture are 6.5% of the total number of accidents across all work sectors; the percentage of fatal cases, compared to all professions, is equal to approximately 8.3% [12]. In recent years, the general trend shows a clear decrease in both accidents and injuries in agriculture for all professions. It is considered, however, that the decline of injuries can be partly attributed to the increasing unemployment in all professions, including the agricultural sector.

In 2012, a study on occupational diseases in Italy was compiled by the National Institute for Insurance against Accidents at Work (INAIL); it showed a clear increase in the emergence of so-called "hidden diseases" as a consequence to the introduction of a national decree (Ministerial Decree 09/04/2008 "New tables of diseases with legal presumption of occupational origin"); "hidden diseases", "osteoarticular", "muscle-tendon" disorders and other similar diseases due to biomechanical overload and vibration, represent the highest record of complaints from agricultural workers [13].

The European Agency for Safety and Health at Work defines risk as "the probability, high or low, that somebody may be harmed by a hazard". This definition defines a probabilistic concept, without indicating the conditions or factors that determine or contribute to an occurrence. A linguistic definition of risk is a "possibility of suffering harm related to the circumstances as far as it is predictable" (www.treccani.it); as suggested by this definition, the risk factor is connected to knowledge, and circumstances are predictable only if we know them and when, at the same time, we perceive their negative potential. Knowledge of risk affects the perception, but not enough, as this is due to a subjective perception that is related to cognitive, organizational, cultural, and emotional factors. As evidenced by Slovic [14] there is often a dangerous discrepancy between the subjective perception of risk and its objective evaluation. A safety assessment can be based only on objective knowledge, but it could be more effective when using procedures to avoid underestimation of risk causing an inadvertent exposure or an overestimation of risk that would cause panic and inability to make decisions [15]. In both cases, there is an increase of probability of a "mistake", that means a wrong answer to a condition of adaptation; cognitive "dysfunctions" happen, with an alteration in the perception of risk; to avoid these conditions, it is necessary to identify the environmental, psychological, and behavioral causes [16].

The perception of risk is the result of a very broad range of factors, primarily cognitive, emotional, and socio-organizational factors [17]. The severity is clear for nonperceived risks among agricultural workers when considering the effects of overestimating or underestimating the risk itself; both conditions have serious consequences on people's ability to manage risk properly, especially from the point of view of prevention [18].

During the working day, the agricultural operator can be subjected to a variety of risks. The use of machines is one of the main risks: official data on agricultural accidents in Italy show that tractors are responsible for 10% of accidents among all sectors and for 35% of fatal accidents in the agricultural sector [12]. The main

risk refers to tractors overturning when in operation due to a sloping terrain, or from towing requiring excessive effort or due to abrupt movements [12]. Another important risk factor is related to noise; excessive exposure to noise can cause a loss of hearing in humans, from partial loss of hearing to total deafness depending on the level of noise exposure. This damage to hearing is irreversible and can directly impact a person's social life and relationships. There is also a significant correlation between exposure to noise and vibration (individual or combined factors) and the delay in reaction [19]. Also, the vibrations could cause serious damage to an agricultural operator: damage can be of different entity and kind depending on various parameters such as acceleration, frequency, mode (whole body, hand-arm), and exposure time.

Another important risk faced by farmers is the risk associated with exposure to substances used in work cycles (including dust that is generated during processing) that may be hazardous depending on the circumstances [20]. People do not always have a correct perception of chemical risk. A study was conducted in Brazil with the aim of analyzing the perception of risk related to exposure to pesticides; the study showed that protection strategies are more used among the male population, than among the women population. The perception of risk and working practices are influenced by cultural models and premises that need to be taken into account to develop effective intervention strategies, including communication strategies on risk prevention [21].

The main risk factors for work-related musculoskeletal disorders [22–24] are present in jobs that involve manual handling of loads, performing repetitive movements for long periods, and maintaining fixed wrong postures. These diseases are multifactorial in origin and are now recognized as work-related diseases. These diseases are very frequent in agriculture and are among the major work-related health problems [13], and they have important economic and social costs (sick leave, health, job changes, disability).

We have also to consider gender-related differences. According to recent studies by the EU [25,26], women working in the sectors of agriculture, hunting, and forestry are more likely to be involved in work accidents than women operating in "hotels and restaurants" and "health and social work"; injuries are mainly due to an incautious exposure to chemical, physical, and ergonomic risks and also intimidation and discrimination in the workplace.

Agricultural workers in outdoor and indoor environments are also subject to risk factors from exposure to UV rays, heat, and ozone [27–30]; these risks are "subtle", invisible, causing problems of various entities of danger, like cramps, respiratory failure, or acute and long-term damage such as skin cancers [31].

Working in solitude can be a risk factor for farmers [32,33]. More often and in every sector, workers are operating "alone" due to the effects of globalization and new technologies; new organizational structures made work less and less structured in time and space, with a bigger number of employees working alone. A careful analysis of risks must always first identify the critical activities that require a team of at least two people and, therefore, confirm the minimum necessary precautions.

Finally, it is important to examine the new and emerging risks, owing to the introduction of innovative and green technologies, or to a growing number of foreign workers—with linguistic and cultural differences and usually coming from worse economic and social conditions—or the young workers that are more exposed to physical work factors such as noise, vibrations, heat/cold, and much more.

Training and information play a very important role in the prevention of risk so much that the European Community directive 89/391/EEC defines the content of information and training that the employer must provide to workers; the directive specifies that the content of the information must be easily understandable for workers and must allow them to acquire all the relevant knowledge. The employer must ensure that each worker receives adequate information and training.

The main aim of this research (based on a small sample) was to test the investigation tools, the hypothesis, theories, and methods [principal components analysis (PCA) and Rizzi index]; it can be considered as a pretest in preparation of a wider future research. The research intends to investigate, with a multifactorial approach, how safety knowledge can change the workers' behavior and practices in agricultural workplaces. Workers spend several hours in the workplace every day, so it should be a safe place to work.

One of the main hypotheses investigates the relation between factors such as direct workers experience, acquired knowledge, hazardous work conditions, protections, and practices used by workers. The research wants to test the hypothesis that cultural models and workers' behavior can change positively thanks to safety knowledge acquired through training.

Although an extensive literature review demonstrates that information alone will not affect behavior [34], this study aims to evaluate the effectiveness on the interviewed workers of the safety training based on the EU Directives.

2. Materials and methods

2.1. Checklist description

It was preferred to proceed with a subjective evaluation of behaviors and notions, because work safety training was considered like a complex modification of behaviors and attitudes.

The use of scales of opinions/attitudes, consisting of a series of "items", is justified by the fact that if we formulate a single direct question, it provides answers that are often unreliable, poorly correlated with the phenomenon being studied, and highly correlated with external factors.[1] It is therefore necessary to use a series of questions or items (statements, stimuli), which are subjective/perceptive indicators that are indirectly related with the empirically detected phenomenon [35]. These questions can be formulated through different methodologies: here it was decided to use the Likert scale.[2] For the purposes of this survey, seven main areas were identified to be explored through the following checklist: hazardous machines; noise hazards; vibrations; chemical risks and dust exposure; manual handling of loads; repetitive movements and postures; work carried out in solitude; and training and information.

In a first version, the checklist was composed of 23 items divided in the relevant macro-areas that were specified, and the alternative response was based on a numerical scale from 1 to 10.

In order to limit the influence on responses, it was decided not to use a too structured questionnaire that would specify in detail the issues covered.

Instead, it was decided to change the structure of the checklist and present the different items randomly interspersed with "dichotomous" and compilative questions without using any scale instead of groups of items divided into sections (or macro-sections) (e.g., "Do you have work experience in other fields?", "How many

[1] Responsiveness to the interviewer (or to the interview as a whole), reticence in expressing their opinion (especially if negative), difficulty to summarize in a single answer a multidimensional concept, and so on.

[2] Developed in 1932 by Rensis Likert, it currently remains the most popular and widely used scale because of its easy instrumental administration and coding; it is often used also because the assumptions (items) are very permissive for the construction of the instrument; this permissiveness is also the cause of one of the major criticisms of the Likert scales: they accurately detect the opinions and attitudes but they say nothing about the causes of these opinions [36,37].

years have you worked in the field of agriculture?"); in order not to influence the response the word "risk" contained in some items has been eliminated and the questions were reformulated, making them as much as possible without stimuli.

Also, having considered the numerical scale from 1 to 10 excessively confusing, a system adopted to reduce the alternatives of response from 1 to 5.

The search tool that we delineated is a second (and final) version of the questionnaire consisting of 25 items to be answered on a scale from 1 (poor/no effect) to 5 (good/relevant).

Each questionnaire session was preceded by a short introduction in which the anonymity and the method of completion were pointed out to the interlocutors.

2.2. Description of the sample

The data collection was made possible thanks to the collaboration with farmers and with the National Confederation of Farmers (Coldiretti).

Specifically, the questionnaires were administered at the Office of Territorial Viterbo, the Office of Territorial Tivoli (Rome), and the Territorial Headquarters of Velletri (Rome). The criterion for sample selection was random: the questionnaire was proposed to 150 farmers during meetings at their trade associations. A total of 119 of 150 people (79.3%) collaborated on the survey, answering the questionnaire.

The population investigated was composed of 119 farmers, of which 81.5% (97 units) were male and 14.3% (17 units) were female, while 4.2% (5 units) did not specify sex.

As regards the age groups, the sample is divided as shown in Fig. 2. Fig. 3 shows the subdivision of the sample by qualification.

With regard to having attended training courses on safety at work, 62.6% (72) reported having attended courses while 37.4% (43 units) reported never having attended safety courses. It turns out, however, that the majority of individuals who reported having attended training courses on safety worked for several years in the agricultural sector compared to those who reported never having attended courses on safety.

Regarding the direction of production instead, the operators who answered the questionnaire worked in the following types of farm: 68.4% (67 units) worked in agriculture; 14.3% (14 units) operated in animal farming; 11.2% (11 units) operated in the agro/livestock; and 6.1% (6 units) dealt with another.

As regards the area of the surface of the farm, the sample was divided as follows: 22.7% (27 units) operated on an area ranging from 0.6 ha to 3 ha; 16.8% (20 units) operated on an area ranging from 3.1 ha to 8 ha; 20.2% (24 units) operated on an area ranging from 8.1 ha to 20 ha; and 18.5% (22 units) operated on surfaces ranging from 20.1 ha to 170 ha.

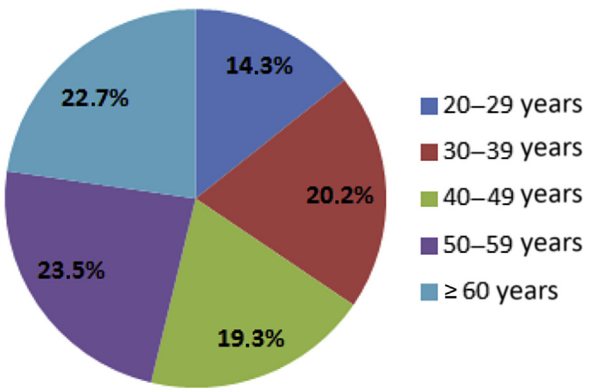

Fig. 2. Subdivision of the sample into age classes.

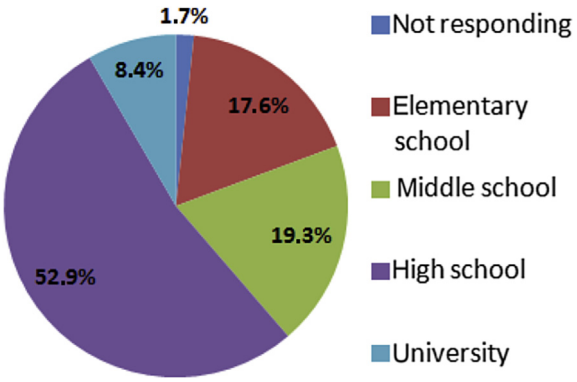

Fig. 3. Subdivision of the sample by qualification.

Furthermore, it was observed that 72.3% (86 units) had work experience in other sectors while 27.7% (33 units) had no work experience in other sectors.

Finally, regarding the years of work in the agricultural field, the sample was divided as follows: 30.5% (36 units) worked in the field from 1 year to 11 years; 24.6% (29 units) worked in the field from 12 years to 20 years; 24.6% (29 units) worked in the field from 21 years to 34 years; and 20.3% (24 units) worked in the field from 35 years to 73 years (some sample people had worked in agriculture since they were children).

2.3. The PCA

It was decided to perform a PCA with exploratory and comparative purposes with the dimensions described above [38]. This is because through the use of the PCA, it is possible to highlight and verify the latent dimensions underlying the collected data in comparison with the scale of attitudes, having an auxiliary theory to the measurement through the reliability measures that take realistic account of the multidimensionality of the complex phenomenon studied [39].

This kind of data analysis is "referred to finite number of exactly defined statistical units, on the base of which modalities of K qualitative/quantities characters were surveyed, and the sample theory was not used, because the sample is a whole population", as affirmed by Rizzi [40]. Consideration based on the inferential character would be meaningful only in case of units from a random sample, but in this case, the survey has explorative aims and it is only a pretest and a preevaluation of the perception of risk/danger of the investigated sample.

3. Results and discussion

3.1. PCA

The main results obtained from the PCA are shown above, illustrating here for brevity are only the results of the "varimax rotation" (that resulted in the most successful method). In Table 1 we find the values that indicate the percentage of variance explained by the PC[3] choices based on the analysis of the 23 eigenvalues.

[3] Considering the 22 subjective-perceptual indicators items, their degree of reliability such as consisting measures (min $|r_{XjPCj}| = |0.3\text{-}0.4|$ in rotated factors) of the size of the latent complex phenomenon in question, which in the PCA are uncorrelated [41].

Table 1
Principal components analysis (PCA): main results on the Likert scale. Eigenvalues indicate the % of total inertia explained by the PC both in the originary factors and in rotated varimax

Components	Unrotated eigenvalues			Varimax rotation eigenvalues		
	Total	% of Var	Cum %	Total	% of Var	Cum %
1	5.488	24.946	24.946	3.926	17.847	17.847
2	2.388	10.856	35.803	3.222	14.647	32.494
3	1.861	8.458	44.260	2.589	11.767	44.260

Cum: cumulative; Var: variance.

It was decided to remove three PC which together explain 44.26% of the total variance and optimize the cost-benefit analysis (the introduction of a fourth component would have resulted in an increase of about 6% of the variance reproduced, while extracting only two components would explain a portion of very low variance equal to about 36%). The three components are not in any way superimposable with the dimensions speculated by the authors of the questionnaire either because of the number of components, in this case reduced to three, and because of the semantic content of the PC. The correlations between the original variables (22 items) and the PC are shown in Table 2.

The first factor was called "self-perception of the direct risk": respondents perceive and recognize certain direct risks, and then choose to protect themselves adequately and properly from these risks. The second factor "damage and fatigue" highlights how the work is perceived as arduous (posture, fatigue, noise) and sometimes dangerous (using machines). Finally, the third factor "ergonomics comfort" refers to the difficulty determined by the execution method of work.

3.2. Synthetic indexes calculated with the method of "the sign of the first component": the Rizzi index

The synthetic index of Rizzi[4] was chosen as the main index (also called the method of "the sign of the first component"), to avoid the loss of information while getting a unique index with a ranking of 119 multidimensional farmers based on their attitude/opinion (detected through $k = 23$ variables) that goes from negative to positive (zero here would take the meaning of "neither agree nor disagree").

It was considered more useful for the purposes of this research to have a synthetic index that while identifying an underlying/latent dimension, was also referring to the general attitude towards safety at work and the adoption of appropriate measures of protection and prevention; it is a complex phenomenon that could be entirely investigated using this approach.

The advantage is that the index of Rizzi takes into account all the available information[5] (the total variance of the original cloud of points), and it has an accuracy of 100% as it is based on all PCs that are, in the PCA, independent of each other and are an exact transformation of the original variables (if taken all reproduce the original total variance). So, with this index in this case, you can graduate the 119 farmers on the basis of 23 PCs added according to the criteria of "optimality" inherent in the PCA. So, the proposed methodology does not require interpretation of the underlying dimensions and safeguards the multidimensionality of the phenomenon. The index has the following expression [43,44]:

Table 2
Principal components analysis (PCA): main results on the ratings given in the Likert scale (scores 1–5). Componential weights {correlations between the original variables (22 items) and PC} varimax rotation

Items	Componential weights varimax rotated		
	1	2	3
He believes that ear protectors are useful protection	0.759	0.228	−0.110
He uses ear protectors during noisy working	0.756	0.060	0.063
During his employment how often he applied the concepts learned in the courses	0.718	0.242	0.139
He observes the information on the product label during the use of fertilizers and pesticides	0.705	0.045	−0.131
He wears gloves when using portable equipment (brush cutter, chainsaw...)	0.662	−0.124	0.204
He considers it is necessary, when working alone, to have a medication package (first aid)	0.452	0.354	0.281
He considers the maintenance of machinery and equipment for reducing vibration is useful	0.387	0.127	0.124
He considers the tractor roll-bar useful	−0.048	0.729	0.081
He considers it necessary to have a communication device for any emergency cases	0.114	0.646	0.171
He considers that a correct posture decreases possible problems for the musculoskeletal system	0.154	0.616	−0.044
He considers significant vibrations (oscillations, shaking) in agriculture	0.068	0.596	0.326
He considers it useful to adjust the seat with the specially provided lever or knob, according to his weight	0.244	0.552	0.053
He considers it useful attendance training courses	0.463	0.481	−0.195
He believes that the risk due to noise is significant in agricultural sector	0.429	0.441	0.204
Considering his recurring most uncomfortable working, how much he believes his posture is correct	0.104	0.430	0.155
He considers that the tractor can overturn when working on sloping ground	−0.056	0.406	0.313
He believes that jobs requiring frequent use of the upper limbs may cause disease	−0.102	0.125	0.743
Assuming having to load fruit boxes on a trailer, how much he considers the job heavy/tiring	0.128	0.169	0.609
How often masks are worn during the use of machinery and equipment	0.335	−0.217	0.580
He considers it useful to use protections for health	0.508	0.112	0.532
He considers the use of seat belts when the tractor is equipped with a roll-bar necessary	0.213	0.203	0.529
He considers that the gloves are useful protection from vibration	−0.119	0.203	0.479

$$D_i = (segnc_{i1})\sqrt{\sum_{i=1}^{k} c_{ir}^2} \quad (1)$$

Using the classic method of single factor solution, the positive or negative attitude refers to the "semantic" meaning given to each chosen PC, while the method of the sign of the first component

[4] This synthetic index makes it possible to consider all k PC and making a linear combination of them with the sign of the first component by taking all the scores and constructing the index for each unit, using the coordinates that it has on each of the main axes [42].

[5] It may also be useful in case there aren't enough elements to decide on the number of components necessary to reconstruct the phenomenon.

Table 3
Matrix (119 × 1) of the synthetic index of attitude towards statistics in ascending order, calculated by the method of the sign of the first component. Multidimensional ranking of $n = 119$ farmers within the negative attitude (negative scores), neither negative nor positive (0), and positive (positive scores)

−12.6561	−3.6473	999.0000*	999.0000*	5.3045
−10.9979	−3.3932	0.0000	2.2878	5.4706
−10.0356	−3.2117	0.0000	2.4189	5.6691
−9.1420	−3.0984	999.0000*	2.5200	5.8371
−8.6825	999.0000*	0.0000	2.6139	999.0000*
−8.4696	−2.9272	0.0000	2.7114	5.9954
−7.8610	−2.8541	0.0000	2.8604	999.0000*
−7.5117	999.0000*	999.0000*	2.9484	6.1868
−6.8959	−2.6815	0.0000	3.1732	6.3942
−6.5276	−2.5021	0.0000	3.1732	6.6914
−6.1998	−2.3780	0.0000	3.3509	999.0000*
999.0000*	−2.2757	999.0000*	3.4417	7.0193
−5.9116	−2.0949	0.0000	3.5673	7.2607
−5.5785	−1.9387	0.0000	3.6578	7.7325
999.0000*	−1.8357	0.0000	3.7613	8.4738
−5.3581	−1.7360	1.0791	3.8794	9.9145
−5.1690	−1.5585	1.2348	4.0119	999.0000*
−4.9874	999.0000*	1.3226	4.2024	999.0000*
−4.8307	−1.4738	1.4325	4.3427	999.0000*
999.0000*	−1.3536	1.4325	4.4683	
−4.6474	−1.2245	1.7194	4.6003	
−4.4556	−1.0957	1.8139	4.7389	
−4.2428	999.0000*	1.9161	5.0275	
−4.0439	0.0000	2.0324	5.0275	
−3.8727	0.0000	999.0000*	5.1753	

* 999,000 featuring individuals who did not respond to questions.

refers instead to the attitude/opinion as a whole (global), negative, neutral, or positive towards work safety in agriculture, considering the phenomenon in all its multidimensionality and having an auxiliary theory to allow empirical measurement. In Table 3, the synthetic index is reported in ascending or multidimensional ranking of 119 respondents (100 valid) obtained with the method of the first component.

From the index, we can see that individuals who show a strong negative attitude, reach higher scores than the individuals with a positive attitude. This may indicate that the noncompliance with safety regulations is strongly rooted, perhaps because it corresponds to a mode/work culture prior to the legislation that could be called “visceral” and less rational than to follow and believe right procedures (acquired by workers in recent years and that it will slowly turn into a culture rooted).

We have divided the multidimensional ranking into five categories: two categories related to the negative attitude (i.e., above the average score that corresponds to zero) and two related to the positive attitude (see Fig. 4). From the graph in Fig. 4, intermediate positions seem to prevail between those who have positive or negative attitudes; overall there is a higher percentage of respondents who respect and know the rules.

The distributions of the ranking are reported in a multidimensional attitude according to three background variables: having attended safety courses, the age categories, and years of work experience in the field. Having attended safety courses (Table 4) has an influence on the attitude of respondents: people who have not attended courses prevail between those who have a negative and uncertain attitude (18.8% vs. 14.1% and 31.3% vs. 23.4% among those who pay little attention) and vice versa the people who have attended the courses tend to have positive attitudes.

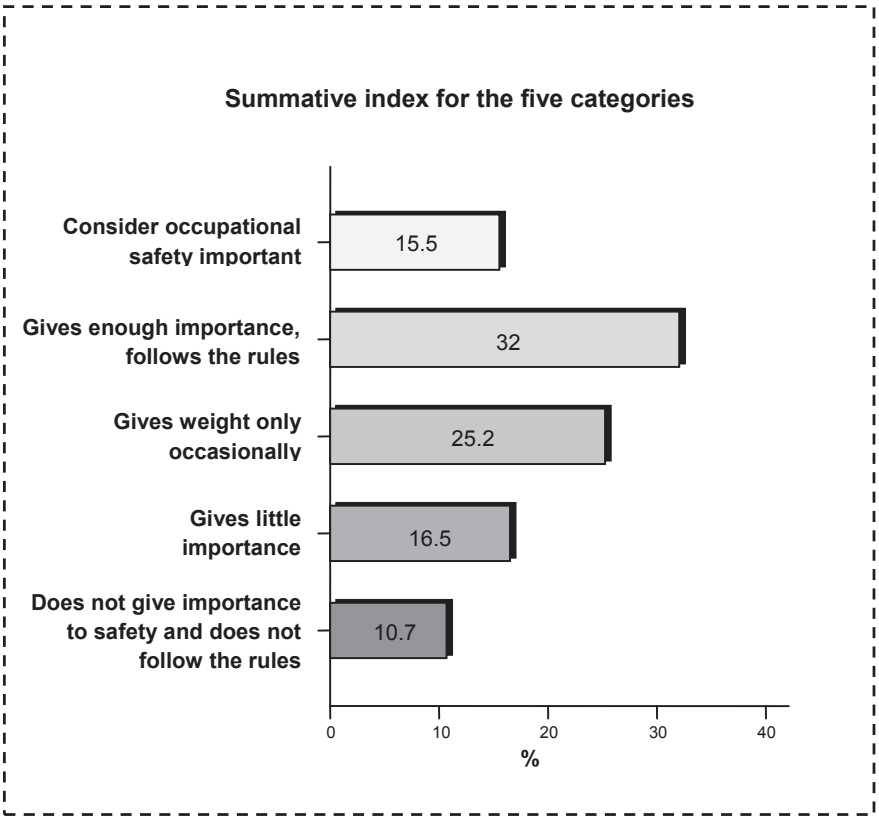

Fig. 4. Rizzi index in five categories.

Table 4
Rizzi index in function of attending courses on occupational safety and health (O.S.H.)

Rizzi index approach towards the implementation of O.S.H. in categories	He attended training courses on safety and health at work		
	Yes (%)	No (%)	Total (%)
He attributes no importance nor gives effect to O.S.H.	14.1	18.8	15.6
Little importance	23.4	31.3	26.0
Undecided	10.9	12.5	11.5
He considers important knowing and implementing O.S.H.	34.4	25.0	31.3
He gives great importance and respects O.S.H.	17.2	12.5	15.6
Total	100.0	100.0	100.0

O.S.H., occupational safety and health.

Table 5
Rizzi index in function of age

Rizzi index approach towards the implementation of O.S.H. in categories	Age classes			
	20–40 years (%)	41–59 years (%)	≥60 years (%)	Total (%)
He attributes no importance nor gives effect to O.S.H.	17.6	10.0	20.0	14.9
Little importance	26.5	32.5	5.0	24.5
Undecided	8.8	12.5	20.0	12.8
He considers important knowing and implementing O.S.H.	26.5	37.5	25.0	30.9
He gives great importance and respects O.S.H.	20.6	7.5	30.0	17.0
Total	100.0	100.0	100.0	100.0

O.S.H., occupational safety and health.

It would be interesting to investigate whether the frequency of the courses led to an improvement of the attitude or those who have attended the courses had a better attitude towards safety: this can only be done by repeating the survey before and after the course.

As shown in Table 5, there is not a strong correlation of the attitude towards the safety in function of age; however, the two classes of extreme ages show a strongly negative attitude (older show more hostility), even if within the same age category we also find the highest percentage of individuals with a more positive and safe attitude.

The age group 41–59 years prevails in both positive and negative attitudes. With regard to the consideration of the variable background "years of work in the field" (Table 6), we can observe that also in this case, the correlation between the two variables is not strong.

Table 6
Rizzi index in function of working years in agriculture

Rizzi index approach towards the implementation of O.S.H. in categories	Working time in agriculture			
	1–20 years (%)	21–35 years (%)	36–73 years (%)	Total (%)
He attributes no importance nor gives effect to O.S.H.	17.0	7.4	21.1	15.2
Little importance	22.6	33.3	21.1	25.3
Undecided	9.4	18.5	15.8	13.1
He considers important knowing and implementing O.S.H.	28.3	37.0	26.3	30.3
He gives great importance and respects O.S.H.	22.6	3.7	15.8	16.2
Total	100.0	100.0	100.0	100.0

O.S.H., occupational safety and health.

It is among the people who have worked for more years that we find the highest percentage of strong negative attitude; while farmers who have worked for fewer years have a marked positive attitude.

4. Conclusion

The results of this survey are partially consistent with those of a similar study conducted on a sample of 273 workers in central Italy in 2012 [17]: the results of the study showed that "approximately 11% of the workers do not consider their job as being dangerous; the risk perceived by the workers is higher for accidents that cause an immediate injury compared to those which cause professional illnesses, except the risk deriving from noise/vibrations. A direct correlation was found between the job as being dangerous and having attended courses on accident prevention".

Always considering the limitations set forth above, the analysis of the questionnaires through the synthetic Rizzi index method mainly showed how radical the negative attitude is towards safety by agricultural workers involved, and in particular, the elderly workers are the most hostile, especially if they have not attended special courses; this category shows a general "distrust", as it regards work health and safety aspects. This leads us to affirm that the critical sociocultural matrices are the most difficult to remove, because it is an integral part of the attitudes and behavior, and because their "removal" presupposes the willingness of experts to propose and adapt to a participatory ergonomic training that could be defined as bottom-up [45].

In accordance with other studies [46,47], data shows that the perception of risk is related to having attended training courses, but those who report having attended safety courses do not always enact safe behavior. It is important to reflect on both the tasks involved and the quality of training. The information and training are not, in fact, something static, of mechanically acquired once and for all, but constitute two dynamic complex processes.

It is important to train a worker according to an ergonomic approach and, therefore, a participatory approach, which increases the expertise. Training should not be one-way communication of knowledge from the expert to the farmers, but instead it should enhance the experiences of the worker and develop their individual decision-making skills [16].

In the view of the authors, the prevention and reduction of risks should use methodologies and a range of interdisciplinary actions such as the assessment and resolution of critical design, looking at the environmental and process aspect, to those inherent stress and sociocultural dynamics.

In conclusion, the method used for assessing the risk perception of agricultural workers led to useful results, despite the small sample size. For the future, it seems appropriate to replicate this kind of investigation in other contexts (different region or country, specific type of farm), on larger samples, also making a correlation with accident data.

Conflicts of interest

The authors have no conflicts of interest to declare.

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