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Assessing the Impact of Point-based License Systems on Road Safety: A Systematic Review and Meta-analysis

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ABSTRACT

Background: The driver's license point-based system is a preventive measure for penalizing offenses committed by drivers with the aim of reducing road accidents, which has been applied in a large number of countries to date. The aim of this systematic review was to examine a set of studies that analyze the effectiveness of point-based licensing in relation to the reduction of road accidents, as well as its impact on other variables documented in the scientific literature. Method: In this systematic review and meta-analysis, we searched PubMed, Scopus, and Web of Science for reports published between date of database inception and September 2023. The review process was conducted following the PRISMA recommendations and requirements. This procedure acquired 26 items that met the eligibility requirements of the study. Results: It is noted that point-based driving licenses are beneficial for road safety as they discourage drivers from committing infractions or risky behaviors and, consequently, contribute significantly to reducing road accident rates in the regions where they are applied. Specifically, meta-analysis indicate that point-based driving license reduced, as an overall, around 21% the negative outcomes related to traffic, 10% fatalities, and 9% non-fatal injuries. In addition, it is identified that users value the measure positively, and perceive that its purpose is to raise awareness and improve road safety, rather than its sanctioning or collecting role. Conclusions: The findings support the implementation and expansion of the point-based license system in more countries around the world as a valuable strategy to reduce traffic accidents and promote a safer driving culture.

La evaluación del efecto de los sistemas de carné por puntos en la seguridad vial: revisión sistemática y meta-análisis

RESUMEN

Antecedentes: El sistema de carné por puntos es una medida preventiva para sancionar las infracciones cometidas por los conductores con el objetivo de reducir los accidentes de tráfico, que se ha aplicado en un gran número de países hasta la fecha. El objetivo de esta revisión sistemática fue examinar un conjunto de estudios que analizan la eficacia del carné por puntos en relación con la reducción de los accidentes de tráfico, así como su impacto sobre otras variables documentadas en la literatura científica. Método: En esta revisión sistemática y meta-análisis se realizaron búsquedas en PubMed, Scopus y Web of Science de informes publicados entre la fecha de inicio de la base de datos y septiembre de 2023. El proceso de revisión se realizó siguiendo las recomendaciones y requisitos PRISMA. Con este procedimiento se obtuvieron 26 artículos que cumplían los requisitos de elegibilidad del estudio. Resultados: Se constata que los permisos de conducción por puntos son beneficiosos para la seguridad vial, ya que disuaden a los conductores de cometer infracciones o conductas de riesgo y, en consecuencia, contribuyen significativamente a reducir la siniestralidad vial en las regiones donde se aplican. En concreto, los meta-análisis indican que el permiso de conducción por puntos redujo, en conjunto, en torno a un 21% los resultados negativos relacionados con el tráfico, un 10% las víctimas mortales y un 9% las lesiones no mortales. Además, se comprueba que los usuarios valoran positivamente la medida y perciben que su finalidad es concienciar y mejorar la seguridad vial, más que su función sancionadora o recaudatoria. Conclusiones: Los resultados apoyan la implantación y expansión del sistema de carné por puntos en más países del mundo como una valiosa estrategia para reducir los accidentes de tráfico y promover una cultura de conducción más segura.

The driver's license point system is a preventive measure for sanctioning infractions committed by drivers with the aim of reducing road accidents in the countries or regions where it is applied (Rebollo-Sanz et al., 2021). Depending on the country, the driver's license point system may consist of decreasing or increasing the points owned by a driver or holder of a driver's license or authorization (Dong et

al., 2019; Padilla et al., 2018). The validity of the driver's license or authorization is contingent on its holder not losing the total credit of points granted for driving or not achieving the number of points stipulated for this to happen, depending on the system or procedure established. The regulations developed in different countries specify to users the points assigned to each of the penalized infractions as well as other elements of the driver's license point-based system (Novoa et al. 2010). Therefore, the requirements associated with the loss of the license validity due to the commission of traffic offenses are also specified, as well as the requirements to recover lost points (Montoro et al. 2008).

At a theoretical level, it is pointed out that the Driver's License Point-based System is an appropriate measure to influence the recidivist driver (Shaaban, 2017). This happens because it is a measure that affects all users in the same way, having the same sanctioning power (Lee et al., 2018). While punitive measures such as financial penalties modulate their capacity to be effective according to the socioeconomic level of the sanctioned driver, the loss of points has the same impact regardless of a user's characteristics (Domjan, 2014).

Dimensions of Driver's License Point-based System

The basic principles of the Driver's License Point-based System include a punitive, preventive, reinforcing, re-educating, rehabilitating, and conditional dimension.

Thus, this system contemplates a punitive function for certain offending road behaviors since it applies a sanction that can be administrative or criminal, additionally and complementarily punishing risky behaviors that violate traffic regulations (Lind et al., 2005). It also has a preventive dimension because it promotes the necessary deterrent effect both on the driver who violates the rule habitually and on the rest of the users as a measure with a general prevention effect of infractions (Castillo-Manzano & Castro-Nuño, 2012). In relation to the reinforcing dimension, this system encourages the driver to keep all the assigned points in exchange for obtaining some benefit, either from private entities such as insurance companies or from the public administration itself (Dec No 4-19).

On the other hand, the Driver's License Point-based System takes a re-education function into account by which the driver may recover the partially lost points credit or all of them, with the completion of awareness courses and attitude change programs aimed at modifying offending behavior, promoting attitudes of respect for the rules, and safe behavior (Faus et al., 2023). Therefore, it also has a rehabilitative function from the point of view of health, since in the event that the loss of points is due to an illness, for the recovery of the same this would have to be treated prior to any form of incorporation to driving. Thus, in general, the recidivist driver who is diagnosed with a pathology or psychopathology that disqualifies him/her for the correct performance as a driver will be given a treatment program after which, and after the appropriate reevaluation, he/she will be able to rejoin the system (Tortosa et al., 2008).

Finally, a conditional driving function is presented, since, in most countries, an initial allocation of a lower number of points than what is established in the corresponding regulations is established. This contributes to the fact that novice drivers, who tend to commit more infractions than other road groups, are allowed a smaller margin of error to keep the whole points (Scott-Parker et al., 2014). In the event that, after a period of time, no infractions are made, the points can be progressively increased. Thus, at the time of obtaining the license, a circumstance that coincides with the group of young people with the highest accident rate, the driver will have fewer points, so he/she will have to be more vigilant with his/her behavior, in order not to lose the validity of the license, promoting automation of safe behaviors (Russell et al., 2011).

In the same sense and in a complementary way, many of the Driver's License Point-based Systems developed so far have some additional restrictions for this group of the population, such as blood alcohol level or lower speed limits (Lewis-Evans, 2010).

Diferences in the Application of the Driver's License Point-based System by Country

Point-based license systems are applied in various countries around the world. However, their application are not standardised and there are many differences in the systems that are stipulated in the regulations and rules of each region. Table 1 presents the main features of the systems in 28 countries where they are currently applied.

Table 1. Summary of the Main Features of the Driver's License Point-based System by Country

Country	Application	Type of point system	Number of points	Conditional dimension	Re-education course
Australia	National[1]	Gain	14	License dependent	No
Austria	National	Gain	3	No	Yes
Bulgaria	National	Loss	39	Novices	Yes
China	National	Gain	12	No	Yes
Costa Rica	National	Gain	12	Depends on license	No
Cyprus	National	Gain	12	No	No
Czech Republic	National	Gain	12	No	Yes
Denmark	National	Gain	3	Novices	No
Dominican Republic	National	Loss	20	Novices	Yes
Finland	National	Gain	4	Novices	No
France	National	Loss	12	Novices	Yes
Germany	National	Gain	18	Novices	Yes[2]
Greece	National	Gain	25	No	Yes
Hungary	National	Gain	18	No	Yes
Ireland	National	Gain	12	No	No
Italy	National	Loss	30	Novices	Yes
Japan	National	Gain	Variable[3]	No	-
Luxembourg	National	Loss	12	No	Yes
Malta	National	Gain	12	No	-
Mexico[4]	State	Loss	10	No	Yes
Netherlands	National	Gain	12	No	No
Peru	National	Gain	100	No	Yes
Poland	National	Gain	24	Novices	No
Romania	National	Gain	15	No	Yes
Slovenia	National	Gain	18	No	-
Spain	National	Loss	15	Novices	Yes
UK	National	Gain	12	Novices	No
United States[5]	State	Gain	Variable[6]	No	Yes

Note. [1]National with different criminal legislations; [2]there is a mandatory sensibility course but it does not eliminate the acquired points; [3]the amount of points is dependant on previous offenses; [4]data from Mexico City's *Fotocívicas* System; [5]data from California, with many differences from state to state; [6]the amount of points is based on time.

Despite the system being applied in several countries, there is scarce scientific evidence on the effectiveness of point-based licensing. Therefore, the objective of the present systematic review is to gather articles or other scientific papers that investigate this topic in order to identify the impact of point-based licensing on drivers in terms of its potential change in offending behaviors, social perception of this sanctioning system, and potential reduction in traffic accidents, among other related factors.

Method

Systematic Review

A systematic review is a type of research study that seeks to comprehensively collect, analyze, and synthesize, through a specific protocol, relevant and available research on a particular research question or topic (Moher, 2011; Rother, 2007). The main objective of a systematic review is to provide an unbiased and comprehensive overview of the available scientific evidence on a problem.

The systematic review developed in the present manuscript followed the recommendations of the Cochrane Review Group (Lundh & Gtzsche, 2008) and the quality standards and protocols of PRISMA 2020 (Page et al., 2021). The selection, evaluation, and data extraction of the articles were performed independently by the authors of the present article. Subsequently, potential articles were pooled and final inclusion decisions were made based on consensus. The five standard steps were followed in the development of the systematic review:

1. Identifying the research question
2. Finding relevant studies
3. Selecting studies
4. Charting and collating data
5. Summarizing and reporting results

Step 1: Identifying the Research Question

The goal of this literature review process is to identify articles and scientific evidence that provide a comprehensive view of the effectiveness and social perception of the point-based licensing system, as well as its impact on various aspects related to road safety and society in general. In this regard, research on various topics may be included, as long as their main focus is the implementation of the point-based licensing system.

These may be related to the effectiveness of the point-based license system in terms of reduction of traffic accidents, injuries, and fatalities, to the perception and social attitudes allowing to know the public opinion of users, to the driver's behavior in relation to the impact of the point-based license on compliance with the regulations, or to the evolution of this type of penalty system, among other potential topics. Therefore, studies on other types of road accident prevention measures and penalty systems other than the point-based driving license will not be included.

Compiling international research will also allow for the comparison and contrast of the above-mentioned elements according to the country of application. Thus, the main findings evidenced by the scientific literature will be collected and recorded, the limitations that may exist in this type of research will be exposed, and the results will be discussed.

The results include a summary and thematic analysis of all the selected articles.

Step 2: Finding Relevant Studies

The review process was conducted following the recommendations and requirements specified in the PRISMA 2020 reports for systematic reviews (Page et al., 2021). First, a scoping review of the literature was performed. This mapping is a crucial initial stage in the research process before conducting a full systematic review, as it serves to understand the breadth and diversity of the literature on a topic, allowing the potential and scope of the research objectives to be determined. It also serves to identify key terms to be used in subsequent search strategies, which contributes to the effectiveness and completeness of the systematic review.

Following this process, three databases were used for the bibliographic search: PubMed, Scopus, and Web of Science. These were chosen because of their high endorsement by the scientific community, which recognizes them as reliable quality indicators. In addition, we analyzed other reference lists of several scoping reviews of primary research that may have been relevant but were not detected by our search algorithms.

The search was conducted in the first week of September 2023. It does not have exclusion standards based on the year of publication, so the present systematic review considered all literature that had been published between the database creation and the search date. The review included research published in both English and Spanish, and so key terms and Boolean search operators were adjusted to these languages (Table 2).

Table 2. Search Strategy for Articles

Search strategy item	Search strategy
Databases	PubMed, Scopus, and Web of Science
Language filter	English and Spanish language
	The identical Boolean search operator was used across all databases.
Boolean search operator and Keywords	1. (permiso de conducción por puntos OR point-based driving license) 2. AND (licencia de conducción OR driving license) 3. AND (seguridad vial OR road safety) 4. AND (accidentes vials OR accidents OR crashes) 5. AND (percepción OR perception) 6. AND (impacto OR impact OR efecto OR effect)

Step 3: Selecting the Studies

At this stage of the review, articles that were not directly related to the focus of the research were removed. To address possible disagreements in the selection, all authors conducted an individual evaluation of a specific set of titles and abstracts before discussing and reaching a consensus. Gray literature was not excluded, so documents such as doctoral theses, conference papers, editorials, case reports, protocols, or case series were potentially eligible if they focused on the research objectives. In addition to the language of the publication, another eligibility criterion was that the articles were available for full reading, either because they were published in open access or because we were able to request them through the library system we were using.

Step 4: Charting and Collating the Data

The descriptive-analytic method of Arksey & O'Malley (2005) was used to appraise the articles that met the inclusion criteria critically. The following information was taken and recorded for each qualified article: author(s), year of publication, country of study, objectives, method and sample, results (main findings), and key limitations.

Step 5: Summarizing and Reporting the Results

Data extraction is tabulated and documented. Key findings are described, key conclusions are explored, and highlights of the chosen articles are offered. To ensure potential biases in the results, studies also receive a Critical Appraisal Skills Program (CASP) quality assessment.

Meta-analysis

The effect size of the outcomes was estimated directly as Cohen's h or d (both are equivalent) or transformed to d from

other statistics (e.g., phi) or measures of the effect size (e.g., odds ratio). Bare-bones (correcting by sampling error) meta-analyses of experimental effects were performed (Schmidt & Hunter, 2015). The magnitude of the effect was interpreted qualitatively as small ($d = 0.20$, an effect size above 55.6% of all possible effect sizes), moderate ($d = 0.50$, an effect size above 63.7%), large ($d = 0.80$, an effect size above 71.6%) and more than large ($d > 1.20$, an effect size above 80.2%) (Arce et al., 2015; Cohen, 1988), and quantitatively with the probability of superiority of the effect size (PSES; Arias et al., 2020), i.e., the percentage of effect sizes that would exceed the observed effect size. The significance of the mean observed effect was tested transforming d into Zeta scores with the associated probability, and the comparison between observed effects (moderators) with Q statistic (comparison of two correlations; Arce et al., 2023; Cohen, 1988).

Results

Search Results

After eliminating all duplicate articles from the search method, a total of 257 potential articles were collected for the study. A total of 198 items were discarded after reading the title and abstract because they did not address the objectives of the review. A new manual selection was performed after a thorough reading of the remaining articles. This procedure acquired 26 items that met the eligibility requirements of the study. Figure 1 shows the procedure for searching and choosing data sources.
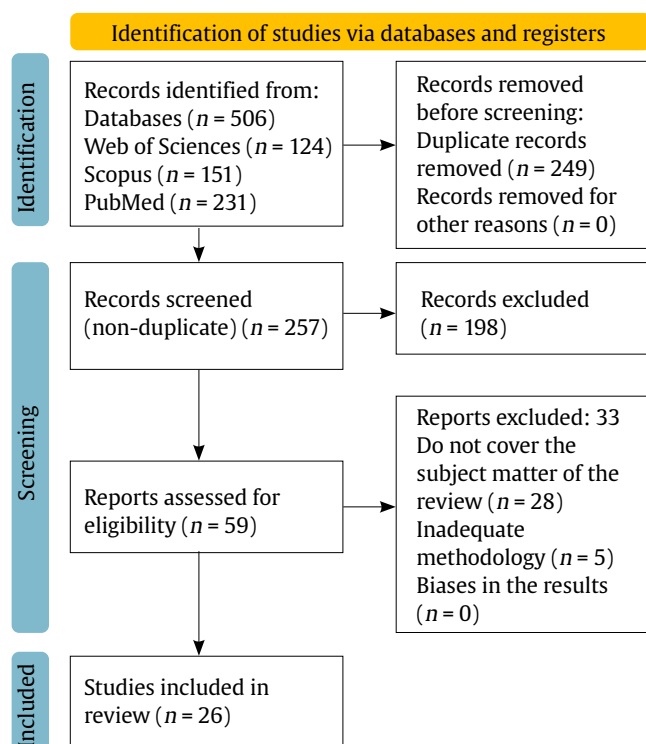

Figure 1. PRISMA Diagram for This Systematic Review.

Characteristics of Eligible Research Articles

The selected articles were published between 1991 and 2019, although most of the research was published in the 2000s (61.5%). Of the total selected studies 20 were published in English and 6 in Spanish. In addition, the studies were conducted in geographically different countries (Figure 2). In this sense, there is representation from 12 countries located in four continents, although most were developed in European countries ($n = 10$, representing 76.9%). Specifically, the distribution by country is Spain ($n = 10$), France ($n = 3$), Italy ($n = 3$), Canada ($n = 2$), Ireland ($n = 1$), Brazil ($n = 1$), United Kingdom ($n = 1$), United States ($n = 1$), Norway ($n = 1$), Austria ($n = 1$), Australia ($n = 1$) and Bangladesh ($n = 1$).
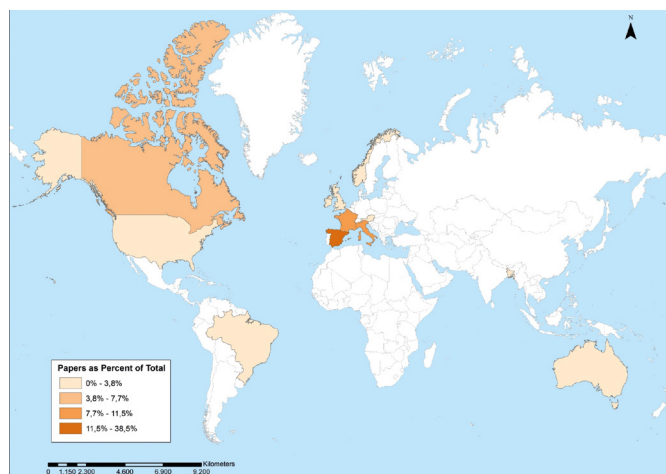

Figure 2. Geographical Distribution (Country of Origin) of Selected Studies.

In relation to the specific topic analyzed, five groups of articles were identified. In the first place, those focusing their research on the potential impact of the introduction of the point-based license on accident rates and fatalities or injuries, which account for 26.9% ($n = 7$). Secondly, there is a group of articles that evaluate its impact but only in relation to the prevalence of infractions, risky behaviors, and/or potential changes in safe behaviors, representing 26.9% of the total ($n = 7$). A third group of articles grouped both the effects of the driver's license point-based system on accident rates and on infractions committed by users, which represent 23.1% ($n = 6$). In this regard, it should be noted that the bulk of the articles evaluate the impact of the introduction of the point-based license on different variables such as accident rates, driver infractions or both, with a total of 20 articles (76.9%). Additionally, there are four articles that focus on evaluating the social perception of this measure, which represent 15.4% of the total ($n = 4$). And finally, there is a very small set of articles that seek to analyze the legal aspects of the legislation or regulations presented by the laws regulating points systems, which represent 7.7% of the total ($n = 2$). From the point of view of the study methodology used, an important part of the studies employ epidemiological methods (38.4%, $n = 10$). These are retrospective studies that use databases of road accidents from official entities or institutions, as well as official figures on infractions and penalties to evaluate the prevalence of accidents and infractions, as well as their frequency and/or severity. Some studies use observational methods, based on the visualization, recording and analysis of information in the real environment. Thus, this type of research represents 15.4% ($n = 4$) and mostly corresponds to the establishment of specific observation points on highways or public roads to record accident data or compliance with regulations. There are also studies (23.1%, $n = 6$) that have used a survey method in which a representative number of participants have been asked about their behaviors, being able to evaluate a specific group of users such as novice drivers or drivers who have received driver re-education courses after the loss of all their license points, or at a generic level to know

the perceptions of the driving license points system in the general population. Finally, four review articles were included (15.4%, *n* = 4), in which the legislation and legal systems that regulate this measure were analyzed, or the existing scientific literature was compiled and evaluated in different bibliographic sources that analyzed aspects related to the implementation of the points system.

In this sense, and also vis-à-vis methodological aspects, most of the selected studies have employed a temporal analysis approach in which certain data are examined and analyzed over a certain period of time to understand trends, patterns or changes in the data. This approach involves collecting and analyzing data at different points in time to assess how certain variables or phenomena evolve or behave over time. Thus, 84.6% of the total research (*n* = 22) has employed this type of approach, while only 15.4% (*n* = 4) has not required data

analysis at different time points, the latter corresponding mostly to review articles and some of the research that used questionnaires.

In any case, although most studies have analyzed the temporal evolution of the data, this does not mean that all of them are longitudinal. A temporal study may have elements of a cross-sectional or longitudinal study, depending on how data are collected and analyzed. Thus, a study is only considered to have a longitudinal methodology when data are collected from a set of people at various points in time to analyze certain trends in their behaviors or perceptions. Thus, only 7.7% (*n* = 2) of the total number of articles fit this requirement. The rest of the studies use a cross-sectional approach since, although data are collected at different temporal moments, the same people are not followed over time. In this case, we would be obtaining a snapshot of the population at various time

Table 3. Record of the General Characteristics of Selected Studies

Author/s, year and country	Objectives	Methods and sample	Results (main outcomes)	Key limitations
Ares and Lacruz (2010) Spain	Analysing citizen perception of the point-based system before and after its implementation.	A questionnaire was handed out to 1,294 participants in 2006 (pre) and 1,462 participants in 2007 (post).	The measure was well received by citizens, being better valued one year after its entry into force. The best perception is among young men, who are one of the most vulnerable groups in the population.	Social desirability bias Non-longitudinal
Bourgeon and Picard (2007) France	Analysing the positive characteristics of the point-based card, taking into account different alternatives.	Different analyses are made on the basic model and alternatives such as incentives for safe driving, probationary licenses, penalties, and license revocation.	Driving licenses by points are beneficial because they favor safe driving for all users (acting as a deterrent) and because the revocation of such licenses affects mostly unsafe drivers (acting as a detection element).	Simplified model Variability in penalties
Butler et al. (2006) Ireland	To evaluate the relationship between the implementation of the point-based system and the prevalence of spinal injuries caused by road accidents.	A total of 966 patients were analysed between 1998 and 2004 with sociodemographic data, type of lesion, and follow-up questionnaires.	Spinal injury accounts for almost 40%, with young people being the most prevalent group. There was an initial reduction in crashes, which has not been sustained over time after the introduction of the point-based licence.	Descriptive analyses
Campos (2011) Spain	Analyse the legal nature of the loss of driving licence points.	Review of Spanish legislation in relation to the point-based licensing system.	The current configuration of the loss of points fits much better with the concept of an administrative sanction than with other measures such as the revocation of the authorisation for non-compliance with the conditions to which it is subject or for the supervening loss of the ability to drive.	No constraints are evident
Castillo-Manzano et al. (2019) Spain	To analyse the influence of legislative changes, their implementation and enforcement in terms of road fatalities over ten years.	Statistical models are applied to identify the impact of different measures.	Two actions are identified as particularly relevant in terms of reducing fatalities, namely the implementation of the point-based driving licence and the tightening of the penal code. A dissuasive role of speed cameras and police controls is observed.	No constraints are evident
Castillo-Manzano et al. (2010) Spain	Identify the effects of the penalty point-based system during the 18-month period following its introduction.	Unobserved univariate and multivariate unobserved component model analyses are carried out, considering several variables.	An impact on the reduction of road traffic fatalities of 12.6% is identified, with a higher maintenance of effects than in other countries. There is also a reduction in the number of injured vehicle occupants.	No constraints are evident
Izquierdo et al. (2011) Spain	Evaluate the impact of the point-based licence on the reduction of road traffic fatalities.	ARIMA time series models are applied, introducing other modelling variables.	A clear positive effect has been observed since the introduction of the point-based license, which has been maintained up to the time of the study. This effect is also linked to surveillance controls and sanctions, as well as the increased presence in the media.	No constraints are evident
Lagarde et al. (2004) France	To discover the prevalence of risk behaviours in relation to the opportunity to cancel penalties and loss of license points.	A sample of more than 13,000 participants followed for more than 10 years.	Individuals who had been able to cancel the anullation and loss of points were more likely to engage in risky behaviours.	No constraints are evident

Table 3. Record of the General Characteristics of Selected Studies (continued)

Author/s, year and country	Objectives	Methods and sample	Results (main outcomes)	Key limitations
Martínez (2012) Spain	To know the perception of drivers who participate in re-education courses on the license point-based system.	A questionnaire was administered to 240 people who had received a road re-education course.	Perceived usefulness was identified in relation to knowledge of the regulations, awareness and association of infringing behaviours and the corresponding penalties and loss of points.	Social desirability bias
Mazumder et al. (2021) Bangladesh	Reviewing the driver's license management system and the point-based system.	A review of the literature on the subject is carried out.	The point-based system is identified as an effective measure, provided that there is control and follow-up of the cases.	Selection and publication biases.
Nallet et al. (2008) France	Identifying the perception of users who take re-education courses of the license point-based system.	A questionnaire is administered to 853 people who have received a road re-education course.	There are different ways of dealing with the situation, with one group of "offenders" and another of "victims" for whom a differentiated system of sanctions and education would be needed.	Cross-sectional questionnaire biases.
Padilla et al. (2011) Spain	Analysis of the implementation of the point-based system in Spain, compared to other countries.	Review of the point-based system in its application in Spain.	The point-based licence is intended to have several effects: a) selective (to keep repeat offenders off the roads), b) dissuasive, c) incentive (motivation to keep full credit points, and d) educational (possible recovery of points through courses).	No constraints are evident
Paz and Cuenca (2019) Spain	Analysis of a public policy instrument for road safety, the point-based driving licence.	Approach to evaluation, understood as the final phase of the public policy cycle and indispensable to analyse the impact of the measure.	Road accident fatalities in the period 2005-2014 have been reduced by 62% and the behaviour of Spanish drivers has changed in a positive way.	No analysis of correlated variables.
Pulido et al. (2010) Spain	Evaluation of the impact of the point-based licence on the reduction of road traffic fatalities.	Analysis of seasonal variation and trend in road accident data series.	It is estimated that in the 18 months following its implementation there was a 14.5% reduction in fatalities, a significant drop.	No analysis of correlated variables.
Roca Ruiz et al. (2009) Spain	Finding out drivers' perception and assessment of the point-based licensing measure.	Implementation of a nationwide telephone survey of 2,014 respondents.	Users give a positive assessment and have high expectations of success. They state that the primary purpose is to raise awareness and improve road safety, rather than to sanction or collect money.	Cross-sectional questionnaire biases.
Sagberg and Sundfør (2019) Norway	Analysing self-reported offending behaviour in terms of driving licence points.	A questionnaire was administered to drivers with no points (n = 1,206), drivers with two or three points (n = 190), drivers with four or more points (n = 172), and probationary drivers with four or more points (n = 193).	The point-based system manifests a deterrent effect both on drivers who are at high risk of losing their licence, and generally on drivers without penalty points.	Cross-sectional questionnaire biases.
Zambon et al. (2008) Italy	Evaluating both the short-term and long-term effects of the point-based licensing system on seat belt wearing behaviour.	An observational study was conducted at different points in time after the implementation of the standard (3 months and 15 months after), observing a total of 29,303 drivers.	Prevalence levels were 54% for drivers rising to 83% after 3 months, and 53% for passengers to 76%, figures that remained stable after 15 months of system implementation.	Convenience criteria in the observation area.
Zambon et al. (2007) Italy	Evaluating the impact of the point-based licence on seat belt behaviour in relation to offending and accident rates.	Observational study prior to the implementation of the point-based system and after its implementation, including a total of 19,551 drivers, 19,057 front passengers and 8,123 rear passengers.	Seat belt use increased significantly after the introduction of the point-based system, with an estimated reduction of 1,545 fatalities, representing an 18% decrease in seat belt fatalities.	Convenience criteria in the observation area.
Bartl and Stummvoll (2000) Austria	Analysing the effect of a point-based system on novice drivers.	A review of the literature is developed to recapitulate the existing scientific evidence and to analyse its content qualitatively.	A 19% reduction in accidents was identified with a combination of a point-based system and a restriction on the lower permitted alcohol consumption limit for novice drivers.	Selection and publication biases.
Diamantopoulou et al. (1997) Australia	Evaluating the impact of point-based licensing on accident and fatality rates.	Statistical analyses are carried out to identify potential differences compared to before the implementation of the point-based licence.	There is an impact on the number of emergency room visits (12% less), on the number of hospital admissions (16% less), and on the number of deaths (4% less).	Not very representative

Table 3. Record of the General Characteristics of Selected Studies (continued)

Author/s, year and country	Objectives	Methods and sample	Results (main outcomes)	Key limitations
Farchi et al. (2007) Italy	Evaluating the effects of the change of legislation with the incursion of point-based licensing in an Italian region.	Poisson models are run to compare rates of emergencies, hospitalisations and deaths between the periods before and after the legislative change.	The effect was reflected in the ED visit rate index (0.87); the hospital admission rate (0.87), and the death rate (0.93), although the effect was smaller than expected and decreased over the months.	Not very representative
Gebers and Peck (2003) United States	Examining the feasibility of predicting crashes from convictions for the general population of drivers in a point-based programme.	The equations allow the identification of drivers at higher risk of crashes so that they can be avoided through enforcement actions.	The model shows that crash and citation rates in post-licence checks resulted in a 14.9% improvement in the accuracy of the "hit rate" for identifying drivers involved in crashes.	No constraints are evident
Hauer et al. (1991) Canada	Analysing different models and variables in preventive measures to identify their effectiveness.	A multivariate statistical model is applied to identify the drivers most likely to be involved in an accident.	It is identified that the model in which points are assigned to violations based on their perceived seriousness reduces the likelihood of a claim.	No constraints are evident
De Figueiredo et al. (2001) Brazil	Analysis of the impact of the introduction of the point-based system on accident and fatality rates.	Data from national databases were analysed.	There was a 21.3% decrease in the number of accidents, a 33.2% reduction in emergency room admissions and a 24.7% reduction in the number of deaths resulting from this cause.	No constraints are evident
Redelmeier et al. (2003) Canada	Assessment of licence suspension due to loss of points for user behaviour.	Case study of drivers whose licences have been suspended.	There was a 35% reduction in the risk of an accident after the sanction, compared to the same user without sanction. This improvement was not sustained over time as it decreased after 2 months of being sanctioned, and was not significant after 3 months.	No constraints are evident
Simpson, et al. (2002) UK	Analysis of the impact of the licence point-based system on novice drivers.	A questionnaire is administered in a British population.	The point-based system for novice drivers did not lead to a significant decrease in accidents in the first year, although it did later on.	Cross-sectional questionnaire biases.

points, this approach being used in 76.9% (*n* = 20) of the articles. Table 3 shows the general characteristics of the analyzed original research articles.

Regarding the discourse lines of the articles, the content analysis program, Iramuteq, was used to identify the communities or groups of words highlighted in the body text of the selected articles. By identifying word communities it is possible to determine the main themes or topics in a set of documents, which facilitates the classification and organization of large collections of articles. Figure 3 graphically represents the communities and relationships between words in the texts.

In this regard, a central block is identified that is located on the axis of the existing relationships and is formed by the words "driver", "point", and "accident". Each of these terms represents the most representative aspect of the central word communities. Thus, the concept "point" establishes a direct relationship with "system", "effect", "penalty", "measure", "license", "control", or "demerit", among others. It is a network of concepts that represent the essence of this system of the driver's license point-based system. This block of terms is intrinsically related to the sanctioning power of this measure. All in all, these terms emphasize how this system operates as a disciplinary and control tool, where drivers accumulate or lose points based on their behavior on the road. The block represented by the term "driver" is directly related to "model", "result", "belt", "estimate", "country", "risk group", or "identify", among others. Therefore, it is a community that is more focused on the characteristics of drivers and their risk behaviors in order to elaborate a profile of the offending driver. These terms are intertwined by the development of analytical models to estimate the risk posed by certain drivers based on their driving behavior. In addition, the community has a small branch, which indicates that there are terms with their own meaning, but closely related to the driver. These are words such as "drive", "study", "design", or "awareness", and are therefore linked to the design of the studies themselves.

Finally, a large community with various related branches can be observed. This whole block is composed of terms framed in the consequences of performing risky behaviors. Specifically, words such as "accident", "death", "reduction", "vehicle", "rate", "trauma", or "emergency" are identified. These, in turn, are linked to terms such as "traffic", "implement", "population", "problem", "road", "injury", "increase", "safety", or "rule". In this context, these terms reflect the complexity of road safety and how legislative elements such as the driver's license point-based system can have an impact on the actions of drivers and, consequently, on the rate of accidents and injuries on the road. This network of concepts is also related to a small block of terms such as "analysis", "fatality", "legal", "intervention", or "combination", a network of terms framed in the process after the loss of points and the withdrawal of the license, evaluating the effectiveness of intervention on drivers.

In addition, analyses were carried out with the Vosviewer program in which the factors analyzed were identified according to the year of publication of articles. Thus, it is identified that around the 2000s, the first researches referred mostly to the driver regarding the repercussions that the point-based license had on his behavior, perception of risk and legal aspects of the measure. This decade is the time of greatest presence of research on point-based licensing. In this respect, as years went by, the number of topics identified increased, although the number of manuscripts published on this subject decreased. The new topics refer mainly to aspects of the vehicle, detection resources or devices, and in recent years to new methodologies such as the use of simulators (Figure 4).
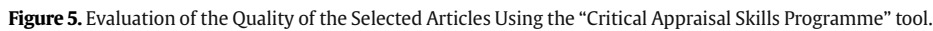
Evaluation of the Quality of the Selected Studies

The quality assessment methodology provided by the Critical Appraisal Skills Program (CASP) was used to ensure that no included study could influence or distort the results of this systematic review.

Figure 3. Representation of the Word and Discourse Communities of the Selected Articles.

Figure 4. Evolution over Time of the Topics Investigated on Point-based Licensing in Driving.

Through a set of ten specific questions, this tool makes it easier for the evaluators to assess the level of rigor, reliability, and relevance of each study (Long et al. in 2020). The results of the evaluation of the selected publications are presented in Figure 5. It should be noted that all studies were incorporated into the review due to their low risk of bias, and no articles previously selected in the screening phase were excluded during this process.

Figure 5. Evaluation of the Quality of the Selected Articles Using the "Critical Appraisal Skills Programme" tool.

Meta-analysis of the Effects of the Point-based Driving License

A total of 25 effect sizes were obtained from the 10 primary studies selected (see data in Table 4). The results (Table 5) for the total effect of the point-based driving license showed a negative (attenuation of negative outcomes), significant, $Z = 1117.11$, $p < .001$, and of a more than large magnitude ($d > 1.20$, an effect size above 83.2%, $PS_{ES} = .832$) weighted mean effect size ($d = -1.371$) for the point-based driving license. Converted the average effect in proportions, the point-

Table 4. Primary Studies Data

Reference	N	Moderator	h/d [95% IC]
Butler et al. (2005)	966	Non-fatal injuries	-0.064 [-0.190, 0.060]
Castillo-Manzano et al. (2019)	25,044	Fatalities	-1.187 [-1.192, -1.182]
Castillo-Manzano et al. (2010)	93,004	Fatalities	-1.152 [-1.154, -1.150]
		Fatalities	-0.335 [-0.336, -0.334]
		Non-fatal injuries	-0.816 [-0.818, -0.814]
		Non-fatal injuries	-1.005 [-1.007, -1.003]
Paz and Cuenca (2019)	93,592	Accidents	-0.774 [-0.776, -0.772]
	2,509	Fatalities	-2.249 [-2.269, -2.229]
De Figueiredo et al. (2001)	585,506	Accidents	-1.136 [-1.137, -1.135]
	42,310	Fatalities	-1.471 [-1.475, -1.467]
	906,762	Risk behaviors	-2.238 [-2.239, -2.237]
	1,313	Non-fatal injuries	-1.737 [-1.762, -1.712]
Farchi et al. (2007)	235,110	Non-fatal injuries	-0,071 [-0,079, 0,063]
	16,995	Non-fatal injuries	-0,096 [-0,126, -0,066]
	1,549	Fatalities	-0,023 [-0,123, 0,077]
Izquierdo et al. (2011)	4,123	Fatalities	-1.026 [-1.036, -1.016]
	38,439	Speeding	-0.714 [-0.717, -0.711]
	16,494	Alcohol traffic tickets	-1.047 [-1.054, -1.040]
	301,017	Belt traffic tickets	-1.204 [-1.205, -1.203]
	56,536	Motorbike helmet tickets	-1.447 [-1.451, -1.453]
Pulido et al. (2010)	4,262	Fatalities	-1.104 [-1.115, -1.093]
Zambon et al. (2008)	46,766	Nonuse of seatbelt	-2.055 [-2.059, -2.051]
Zambon et al. (2007)	46,731	Nonuse of seatbelt	-2.049 [-2.053, -2.045]
	8,570	Fatalities	-1.239 [-1.247, -1.231]
	473,048	Non-fatal injuries	-1.276 [-1.277, -1.275]

Note. N = h/d[95% CI] = Cohen's *d* or h effect size [95% confidence interval].

Table 5. Meta-analyses of the Global Effect of the Point-based Driving License

k	N	d_w	S^2_{obs}	SD_{obs}	S^2_{em}	%VAR	S^2_{res}	SD_{res}	95% IC$_d$		80% CV	
Global effect of the point-based driving license												
25	3279658	-1.371	0.4272	0.6536	0.0000	0.01	0.4272	0.6536	-1.396,	-2.208,	-1.346	-0.535
Effect of the point-based driving license on fatalities												
9	274375	-0.931	0.2120	0.4604	0.001	0.07	0.2118	0.4603	-.0953,	-1.520,	-.909	-0.342
Effect of the point-based driving license on non-fatal injuries												
7	913440	-0.869	0.2647	0.5145	0.0000	0.01	0.2647	0.5145	-0.880,	-1.527,	-0.858	-0.210

Note. k = number of effect sizes; *N* = total sample size; d_w = sample size weighted mean effect size; S^2_{obs} = sample size weighted observed variance of d-values; SD_{obs} = sample size weighted observed standard deviation of d-values; S^2_{em} = variance attributed to sampling error variance; %VAR = percent of observed variance accounted by sampling error variance; S^2_{res} = variance of d-values after removing sampling error variance; SD_{res} = Standard deviation of *d*-values after removing sampling error variance; 95% CId = 95% confidence interval for *d*; 80% CV = 80% credibility values interval.

based driving license attenuates, as an average, in 21.7% (.217) the adverse effects. Moreover, the attenuation of negative outcomes is generalizable to the population of studies (credibility interval has no zero), i.e., the attenuation of the negative outcomes (e.g., fatalities, non-fatal injuries, traffic tickets) associated to driving may be generalized to all studies (and futures). However, sampling error accounts for less than 1% of variance advertising of heterogeneity in primary studies (60% rule: if sampling error variance explains less than 60% moderators explain the heterogeneity of data; Sagie & Koslowsky, 1993). Two productive moderators (*k* > 3 and *N* > 300) were identified in the primary studies: fatalities and the non-fatal injuries. Other moderators (e.g., traffic tickets, safety belt use) could not be studied because *k* was < 3.

The results of the meta-analysis of the effects of the point-based driving license on fatalities moderator (Table 5) exhibited a negative (reduction of fatalities), significant, *Z* = 231.61, *p* < .001, and of a large magnitude (*d* > 0.80, an effect size above 77.6%, PS$_{ES}$ = .776) weighted mean effect size (*d* = -0.931) for the effects of point-based driving license of fatalities. Thus, the point-based driving license reduced the fatalities, as an average, in 10.4% (.104). These results may be generalized to all the population of studies, i.e., the credibility interval has no 0. Nevertheless, the amount of explained variance for by sampling error, 0.01%, advertise of the effect of moderators in results that could not be studied because *k* was insufficient (< 3). Likewise, the results of the meta-analysis of the effects of the point-based driving license on non-fatal injuries moderator (Table 5) revealed a negative (decrease of non-fatal injuries), significant, *Z* = 396.96, *p* < .001, and of a large magnitude (*d* > 0.80, an effect size above 72.9%, PS$_{ES}$ = .924) weighted mean effect size (*d* = -0.869) for the effects of point-based driving license of non-fatal injuries. Reverting this effect to proportions, the point-based driving license decreased the non-fatal injuries by 9.1% (.091).

Comparatively, a significant more attenuation in the reduction of negative outcomes (effect), q$_s$(*N'* = 506383) = -0.029, *Z* = 13.89, *p* < .001, was observed in fatalities in comparison to non-fatal injuries.

Discussion

The purpose of the present systematic review is to find studies and scientific evidence that provide a complete understanding of how a driver's license point system works, as well as its influence on different aspects related to road safety and public perception, covering both its effectiveness and its impact on society in general.

Effectiveness of the Point-based License

Scientific evidence supports that point-based driving licenses are beneficial for road safety as they discourage drivers from performing infractions or risky behaviors and, consequently, contribute significantly to reducing accident rates (Castillo-Manzano et al., 2010; Izquierdo et al., 2011; Mazumder et al., 2021; Pulido et al., 2010;

Zambon et al., 2008). Specifically, the meta-analysis points out that the point-based driving license had, in general, an extraordinarily large effect on the attenuation of negative outcomes related to traffic (above 82%). Thus, point-based driving license reduced, as an overall, around 21% the negative outcomes related to traffic, 10% fatalities, and 9% non-fatal injuries.

This measure is based on the premise that drivers are more likely to obey traffic rules and adopt safe behaviors on the road if they know that their infractions may have serious consequences for their driver's license (Padilla et al., 2011). In this sense, in addition to acting as a preventive or deterrent measure, it also acts as a detection tool, since the sanction and the potential withdrawal of the license affects mostly the most offending drivers (Bourgeon & Picard, 2007).

Thus, a dual effect is observed in which the deterrent effect acts at a general level on the entire driving population, even if they have not yet been penalized with points (Albalate et al., 2013). Nevertheless, this has a particularly relevant impact on those drivers who have been previously penalized and who, therefore, are at high risk of losing their license (Martí-Belda et al., 2019). Sagberg and Sundfør (2019) point out that most offending drivers who had already received penalty points had better knowledge about the functioning of the measure than those without penalty points, becoming more respectful of traffic regulations as they approached the loss of the driver's license. This particularly offending group stated that their driving was influenced by the fear of receiving penalty points. The points system fosters greater awareness and responsibility among drivers as they are aware that they are constantly being evaluated and that their actions on the road have consequences, and favors respect for traffic regulations (Alonso et al., 2023).

However, fear of penalties is not the only factor that modulates driver behavior. Some studies also indicate that associating a certain number of points with each risky or infringing behavior contributes to users' awareness of its dangerousness. In fact, drivers' perception can act as a behavior-modulating variable. Thus, when the number of points associated with offenses is in line with the user's perception of their seriousness, the probability of suffering a traffic accident is reduced (Hauer et al., 1991).

Evidence indicates that the implementation of a point-based driving license system has an impact on driver behavior. Thus, although the systems implemented in the different countries of the European Union in relation to the point-based license vary according to the degree of efficiency achieved in some countries with respect to others, the general experience is positive. Thus, the European Automobile Commission (Comisariado Europeo del Automóvil, 2007) estimates that the reduction in road fatalities is around 14.3%. Similar results are obtained in the research of Castillo-Manzano and Castro-Nuño (2012), in which they estimate a reduction of between 15% and 20% of road accidents, fatalities, and injuries at the international level. Therefore, there has been a sustained reduction in accident rates over time, which is in line with the data provided by the official bodies of the countries that have implemented this system.
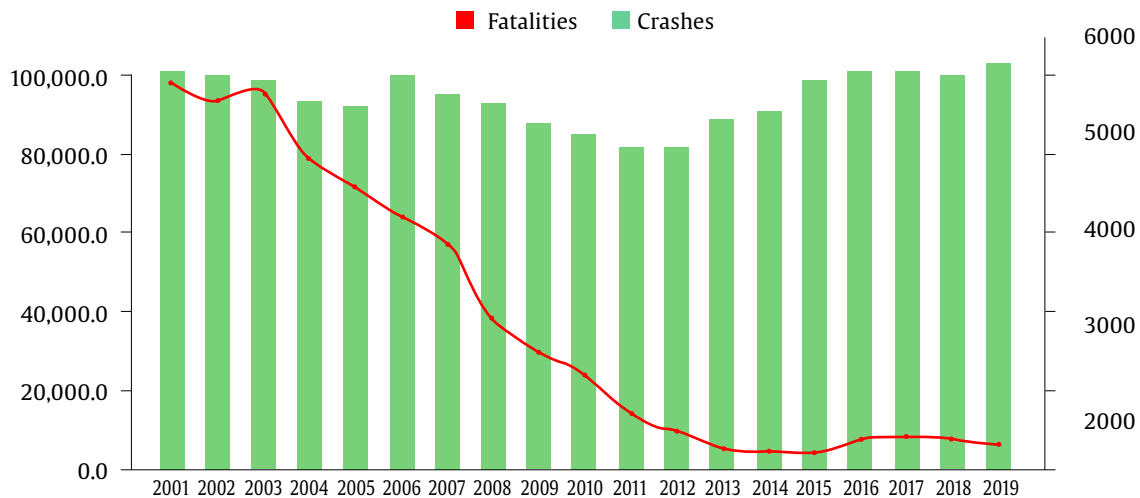
Figure 6. Evolution of Road Accident and Mortality Figures in Spain (Instituto Nacional de Estadística [INE, 2020]).

One of the most studied cases is Spain, which is reflected in the number of articles investigating the impact of the point-based licensing system both at the time of its implementation and in subsequent years. Thus, if we look at the accident and fatality rates after 2006, the year it came into force in Spain, we see a reduction in the data (Figure 6).

Thus, since the implementation of the point-based license, there has been a reduction in both accidents and fatalities. However, as of 2013, and seven years after its implementation, the number of registered accidents began to increase again, and the number of fatalities began to level off. This is in agreement with some of the studies selected in this review, which point to the initial significant effect, but which may be diluted or reduced in the long term (Redelmeier et al., 2003). For this very reason, it is important to promote changes in the point-based licensing system, increasing the penalty for the most common risk behaviors, such as the use of cell phones or speeding (Redelmeier et al., 2003).

Following this line, it should be taken into account that the point-based licensing system is a measure that is not presented in isolation. In addition, other types of sanctions are applied, as well as preventive measures such as surveillance controls, improvement of road infrastructure or communication, and awareness campaigns in the mass media (Faus et al. 2021). In this regard, the evidence indicates that this aspect is very positive since the complementary measures mentioned increase the effectiveness of the point-based license, multiplying its role as a deterrent to risky behavior on the part of users (Izquierdo et al., 2011). Thus, it is beneficial to apply new preventive measures and actions over the years to avoid user habituation and sustain high effectiveness over time (Faus et al., 2022).

Additionally, the system encourages driver education. In fact, people who lose their license in most countries have to undergo a driver re-education program to have the opportunity to regain it (Desapriya et al., 2014; Yue et al., 2020). These programs help drivers better understand the implications of their actions and develop safer driving skills, so that they are not a risk once they get back on the road. Continuing with the case of Spain, the data point out that the acceptance and impact of the programs linked to the loss of the license have been good since their implementation. Thus, according to data from the National Confederation of Driving Schools (Confederación Nacional de Autoescuelas, 2022), of the nearly 850,000 drivers who have undergone a points recovery course between 2006 and 2020, only 1,850 have been re-offenders. For its part, the Polytechnic University of Madrid published a study with positive conclusions on these training programs, since 93%

of those attending said they felt aware and 97% said they would practice safer behavior. Therefore, data reinforce the re-educational role of the point-based licensing system and programs developed for offenders (Elias & Gitelman, 2023; Zambon et al., 2007).

Social Perception

The social perception of the points system is an issue that can vary significantly among different groups of people and depending on the culture and context of each country. Moreover, there are also differences depending on citizens' experience with the system. In this sense, Ares and Lacruz (2010) point out that Spanish drivers rated the point-based license better one year after its coming to effect compared to evaluations made months before, although it never got negative scores. Thus, when it comes to sociodemographic characteristics, there are no differences according to gender. On the other hand, different perceptions were observed according to age, with the group between 20 and 64 years of age having the worst evaluation of the measure. Likewise, people with lower educational levels also had the lowest scores before the implementation of the point-based license (Ares & Lacruz, 2010). In both groups, their perception changed in the evaluation carried out in the year following its implementation, significantly increasing their scores.

In general terms, almost 90% of those surveyed value it as a positive measure, being better evaluated by people who do not drive than by those who do, although with non-significant differences. On the other hand, the measure is slightly better evaluated by people who have been penalized and have lost a point on their driving license compared to those who have not lost any point (Ares & Lacruz, 2010). One possible explanation is that the fact of having been sanctioned provides them with a personal experience of which are the irresponsible behaviors to avoid, and such sanction has caused real changes in their driving behavior, which make them evaluate the effectiveness of the point system positively for behavior modification (Mehmood, 2010).

On the other hand, Roca Ruiz et al. (2009) points out the fact that users perceive that the primary purpose of the implementation of the point-based license is to raise awareness and improve road safety, above and beyond its role as a sanctioning or revenue-collecting measure. This perception is in line with one of the principles on which this measure is based, which is the equality of conditions among the potential recipients of the penalty. In this way, the points system guarantees uniformity and equity among drivers, since each infraction has an associated number of points,

which represent the same value for all users (Kandula, 2006). While with a financial penalty, the same amount may represent a very heterogeneous value depending on the socioeconomic characteristics of the offender, points are equally valuable for all drivers. Therefore, this system ensures that all drivers, regardless of their economic or social status, are sanctioned equally, potentially contributing to behavioral changes and reduction of risky behaviors in all individuals (Zámečník et al., 2017).

Impact and Adaptation of the Point-based Licensing System by Country

The first aspect to highlight is that the research has been carried out mainly in European countries, especially in Spain, Italy and France (Sécurité Routière, 2023). Thus, although the driver's license points system is applied in countries on several continents, the studies are fairly centralized in European regions, representing more than 70% of the total number of studies selected. Why does this situation arise? The main reason is that in Europe this type of penalty system is applied in a large number of countries and it is also applied on a national level, with uniform regulations in all towns, provinces, or states of the region. This is the case in the countries mentioned above, as well as in the United Kingdom, Germany, Denmark, Greece, Hungary, the Netherlands, Romania, among others (Klipp et al., 2011).

On the other hand, in other continents there is often no similar national legislation, which explains the lack of research on this preventive measure in these geographical areas. Thus, in most countries in Africa, Asia, and Latin America, point-based systems do not exist or are currently being developed, with exceptions such as the Dominican Republic, where they were recently implemented to reduce its high road accident rates (Dec. No. 4-19). Moreover, in other regions where such point-based systems do exist, the legislation does not act at the national level, but rather the implementation of the point-based system depends on the states or provinces, with the form of application varying significantly in the different areas of the country. This is the case in Australia, the United States, or Mexico, where each state has its own set of traffic laws and a specific point-based system to penalize traffic violations (Secretaría de Seguridad Ciudadana, 2024; Queensland Government, 2023). Thus, not all states have implemented this system, and in those that do have it in place the specific rules on how many points are assigned for each type of infraction and how many points can be accumulated before more punitive measures are taken vary substantially. As an example of these aforementioned differences, in California a driver can face penalties if he accumulates 4 points or more on his driver's license in a 12-month period, while in Florida a driver can face a license suspension if he accumulates 12 points or more in a 12-month period, and in Arizona, license suspension occurs when 8 points are accumulated in a 12-month period (Arizona Department of Transportation, 2023; Drivers ED, 2021). Additionally, there are differences in other elements of the legislation such as the duration of license points. In Texas, points on the license are kept for 3 years from the date of the offense, after which time they are removed from a driver's record (Texas Department of Public Safety, 2023). In other states in the same country, such as Illinois, points may be kept on a driver's record for different periods of time (Illinois Secretary of State, 2023).

In this regard, it should be noted that, although the term "point-based licensing system" is identified with the procedure in the aforementioned countries, the approach to this punitive tool differs from country to country (Klipp et al., 2011). In the case of the United States, China or the United Kingdom, among others, point earning systems are applied, in which drivers start with points and these are obtained when they commit infractions, having to reach a certain number of points to receive greater sanctions, such as the withdrawal of the license (Government UK, 2022). However, in countries such as Spain, France, Luxembourg, or Italy point loss systems are applied (Klipp et al., 2011). In these, the driver obtains a number of points (which is different in each nation) at the moment he/she obtains his/her driver's license. Thus, after each infraction a certain number of points are withdrawn from the license, and if the driver loses all the points, their driver's license will automatically be invalid, and she/he will have to take road re-education courses to recover points and, consequently, to recover their driver's license.

In any case, regardless of whether a system of gain or loss of points is applied, the purpose and learning principles on which this measure is based are the same (Montoro et al., 2000). Thus, point-based licensing systems are based on behavior modification principles to encourage drivers to behave more safely on the roads (Aparicio et al., 2010; Domjan, 2014). The threat of receiving a sanction is enough for many drivers to avoid performing infringing behaviors, so it is a measure with a preventive value for road accidents (Giménez et al., 2014).

Limitations of the Systematic Review and Future Lines of Research

This systematic review adhered to the PRISMA protocol to minimize any potential influence on the selection and recording of data. In addition, efforts were made to ensure that relevant studies were available in global databases and repositories to promote the quality of the research included in the analysis. Despite these precautions, it is important to emphasize that no systematic review is completely free of limitations inherent to this type of research. In particular, there is a possibility that this review may be affected by publication bias, a phenomenon that manifests itself when studies with unfavorable or non-significant results are not published or are published in journals with lower visibility and scope (Williamson & Gamble, 2005). In addition, the exclusion of studies in languages other than English and Spanish may introduce a linguistic bias, limiting the representativeness of the sample and potentially excluding relevant evidence available in other languages (Grzybowski & Kanclerz, 2019). There is also the possibility of variability in the methodological quality of the studies included in the review, which could have an impact on the findings identified. However, these limitations have been minimized by the application of the Critical Appraisal Skills Programme to certify that the selected articles meet sufficient quality requirements (Long et al. en 2020).

Additionally, two limitations have been observed from primary studies of the meta-analyses. First, the extremely high heterogeneity of the data from primary studies. Second, the limited number of observed effects limits the study of moderators. As for this, the effects attributed to point-based driving license on the use of seatbelt, drug, alcohol, or mobile phone use, or speeding could not be studied. More evidence is necessary on other markers of the effects of the point-based driving license. Thus, future literature should be focused on the effects on the use of seatbelts, consumption of drug/alcohol, and speed.

Conclusions

This systematic review identifies a positive and multifaceted impact of the point-based system on road safety, showing a reduction in violations and accidents after the entry into force of this system in different regions. It is a measure that acts effectively as a preventive, punitive and educational tool for drivers, thus contributing to the reduction of risky behavior on the road. In addition, its effectiveness is enhanced by its ability to complement other interconnected measures, such as police controls or roadblocks, as well as awareness campaigns or road training programs.

It is important to highlight the difference in the number of research articles available depending on the country. The largest number of studies have been conducted in European regions, reflecting the wide

adoption of this system at the national level in several countries in this area. Thus, these regions in particular, have provided a solid base of data and scientific evidence to support its effectiveness.

Overall, this review of the scientific literature reinforces the importance of the point-based system as a comprehensive measure to improve road safety, highlighting its usefulness in deterring risky behaviors, its ability to enforce effective penalties, and its role in continuing driver education. These findings support the implementation and expansion of this system worldwide as a valuable strategy to reduce traffic accidents and promote a safer driving culture.

Conflict of Interest

The authors of this article declare no conflict of interest.

Acknowledgments

Data Availability Statement

The data will be available upon reasonable request to the corresponding author.

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