



## Developments on Baby Strollers over the Last Decade

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### Authors' contributions

This work was carried out in collaboration among all authors. Author B XK performed a comprehensive review on the development of baby strollers over the last decade. Authors UN and MYY supervised the work and designed the contents in this article. All authors read and approved the final manuscript.

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### ABSTRACT

It has come to attention that the interest of baby stroller design is still encouraged and popular among worldwide researches and consumers. A visual history and timeline of invented baby strollers from 1973 to today's baby strollers was drafted. Moreover, a ten years review on multiple designs of baby strollers was done ranging from the year 2008 to 2018. Based on the review, there are many possible ways to design a baby stroller which its sole purpose is to transport a baby in a much easier method. Through this review, it is noticeable that baby stroller inventors are implementing additional functions like rocking mechanism, diaper changing table, and others. The use of electronic devices in strollers is slowly implemented as the years increases, although there always potential ideas for improvements. Graphs and tables on baby strollers by their popularity and brand was drawn with online shopping websites as a resource to recognize consumer's interest. Besides that, potential improvements and ideas on the design and fabrication of baby strollers were suggested to fit in with the impending society and future generation.

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## 1. INTRODUCTION

The comfort and protection of one's child is every parent's responsibility and a desire to fulfil it. Baby strollers are essential for navigating life with your new baby as it helps to ease the burden of carrying the weight of a baby or toddler on long, or even -short walks. The development of baby stroller throughout the years have improved vastly and significantly, from the form of baby carriages to modern implementations of technology and gadgets. This section of a literature review and research will only be focusing on the designs and applications of baby strollers throughout the many years since it was first invented.



**Fig. 1. First baby carriage invented by William Kent [1]**

The very first baby stroller was invented in the year 1733 by a landscape architect named William Kent as shown in Fig. 1. The purpose of this invention was to transport the third Duke of Devonshire's children alongside to amuse them. Designed in a shell-shape, this carriage had a harness aimed to be pulled by animals like goats, dogs or ponies, with a spring suspension to secure a comfy ride for the baby. Back then, carriages then become a fashionable piece that only the wealthiest parents could afford.

A century later in the mid-1800s, the baby strollers have become an easier navigating transport for babies as the designs substituted handles for parents or nannies to pull the stroller behind her, with the baby facing forward instead of having animals do the pulling as seen in Fig. 2. It has been known that pushing is much easier than pulling as it takes a lesser strength and energy from one person. Hence, in 1848, baby

stroller came to America and American innovator Charles Burton changed the original design of the carriage as presented in Fig. 3, so parents could push their children rather than pulling them. The baby stroller was not popular in the United States as inexperienced parents tended to come into contact with pedestrians. However, he managed to patent his designs at England with the name "perambulator", which may be referred now as pram.



**Fig. 2. Carriage in mid 1800s [2]**

In today's market, the seat of the baby stroller can be adjusted so that parents or nannies could have the child facing them or facing away from them, whichever they preferred. This improvement was done by African American inventor William H. Richardson as he patented his design in the United States in 1889. Richardson made changes to the carriage wheels allowing it to move independently compared to the previous non-independent wheels as shown in Fig. 4. This improvement makes the stroller more manoeuvrable and convenient for parents.

Slowly, the evolution of baby carriages has been improving. Following World War I, the safety features on a baby carriages were introduced and updated [3]. Inventors in 1920 made special safety features like bigger wheels, deeper, more spacious, lower and sturdier frames. Having more space, and lower frames can prevent the baby from crawling out or decreasing the distance of the stroller and the ground if the baby



were to escape. In the 1930s, materials like plastic and rubber were common materials being used in manufacturing baby stroller while inexpensive chromes are used as an alternative to brass. By the 1950s, baby carriages are a must have for parents as affordable material and safety features are not just a fashion piece but also budget- friendly [4].



**Fig. 3. The perambulator invented by Charles Burton [2]**



**Fig. 4. Baby carriage invented by Richardson [2]**

Came the year 1965 when London design engineer Owen Finlay Maclaren invented the first umbrella stroller as seen in Fig. 5 after watching his daughter struggled with manoeuvring and travelling with her child and the stroller [5]. Hence, he invented a lightweight and collapsible structures like how an umbrella works as a new generation of baby transport. Maclaren strollers are still in the market to date. In 1984, baby strollers have been made convenient for jogging by replacing the tires to bicycle tires and design of three-wheeled for a steadier frame. These all was reinvented by Phil Baechler after receiving reviews from parents whose jogging is a hobby.

Lastly, the last common features we can see in the market today is the double baby stroller developed by the stroller company Baby Jogger in 1986 as presented in Fig. 6.



**Fig. 5. First umbrella stroller invented by Owen Maclaren [6]**



**Fig. 6. Baby jogger invented by Phil Baechler [7]**

Today's stroller in the market has taken most of the original basic features like ergonomic designs, canopy, rotating wheels, foldable features, rotating seats, and umbrella strollers. The features are not limited to only the ones that have been stated as electrical enhancements such as lights, fans and chair warmers have been incorporated to current baby strollers as well. Fig. 7 shows the baby stroller with basic features in the market today.

Safety features of this improved baby stroller shall meet parents' satisfactions. Shielding will be an important element in this category. Extra cushioning is necessary to protect the baby or child's fragile figure. Five-point harness system will be used because that is the best safety belts to prevent babies from falling or tripping. A mechanical device may be added to prevent bumpy rides and reduce vibrations acting on the baby and a user's hands.

It is important to know that there is always room for improvements and right ideas to achieve a new purpose of an invention. With the world moving forward to an era of smart technology, we are bound to succumb to future needs. Future inventions should be able to fit in with the impending society and generation. Thus, there are always potential ways to modify existing inventions to accord for the future.

The proposed attachments as presented in Figure 41 are a few of the attachments that are essential to a baby stroller. These attachments will benefit both the baby and user as it serves a practical purpose. The idea of combining four attachments into one whole attachment can be considered and implemented. By doing this, baby stroller users would not need to carry multiple attachments when they are in need of it. The attachments are modern and popular items used by society today especially the use of hover board.

## 6. CONCLUSION

Baby stroller design is still a topic of interest, and as an engineer, it is in our profession to look for ways to improve and innovate. There are still functions and potential ways to improve the design of existing baby strollers. A visual history and timeline of invented baby strollers from 1973 to today's baby strollers was drafted. Moreover, a ten years review on multiple designs of baby strollers was done ranging from the year 2008 to 2018. Based on the review, there are many possible ways to design a baby stroller which its sole purpose is to transport a baby in a much easier method. Safety features of this improved baby stroller shall meet parents' satisfactions. Shielding will be an important element in this category. Extra cushioning is necessary to protect the baby or child's fragile figure. Five-point harness system will be used because that is the best safety belts to prevent babies from falling or tripping. A mechanical device may be added to prevent bumpy rides and reduce vibrations acting on the baby and a user's hands.

Graphs and tables on baby strollers by their popularity and brand was drawn with online shopping websites as a resource to recognize consumer's interest. Besides that, potential improvements and ideas on the design and fabrication of baby strollers were suggested to fit in with the impending society and future generation.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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