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A Proposal Submitted as a Partial Fulfillment for the Requirement for the Degree of Master of Arts (M.A.) in English Language Translation Studies

A Comparative Study of Artificial Intelligence (AI) vs. Human Translations in the English-to-Persian Translation of "Exercise & Sport Physiology" by Kenney, Wilmore and Costill' Based on Toury's Translation Norms and Descriptive model

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Chapter I

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1.1. Introduction

Sport and exercise physiology is a complex and specialized field that requires accurate and precise translation in order to convey the information effectively to readers in different languages. In this study, we aimed to investigate the differences between machine (AI and Google) and human translation of the textbook ‘Sport and exercise physiology’ by Wilmore J.H., David L. Costill, W. Larry Kenney, specially we focused on the Persian translation of this textbook by five experts: Dr. Zia Moini, Dr. Farhad Rahmaninia, Dr. Hamid Rajabi, Dr. Hamid Aghaalinejad, Dr. Fatemeh Salami.

The translation of the text book were randomly selected and compared to their machine translation. The sentences and paragraphs from the source text were inputted into the machine translation systems, and the resulting translation will be analyzed for any significant differences.

1.2. Statement of the problem

In this study, the primary focus is centered on the application and utilization of Artificial Intelligence (AI) translation within the realm of sports context. This research seeks to examine and analyze the patterns associated with the employment of AI translation techniques and methodologies within various aspects of the sporting industry. By delving into this subject matter, the study aims to shed light on the growing prominence and potential implications of integrating AI- driven translation systems in the broader sphere of sports communication, management, and marketing.

The selection of this book is primarily driven by its publication date, which predates the widespread implementation and adoption of artificial intelligence (AI) in translation. As a result, the insights and perspectives offered within this text serve as a

valuable point of reference for understanding the landscape of translation before AI-driven advancements transformed the field.

1.3. Significance of the study

AI technology has made great developments in the sports industry in the last five years. The AI applications used in today's sports world are divided into four main categories: chatbot, computer vision, automatic journalism and wearable technology.

AI can be used in sports training to optimize and improve the performance of athletes and teams. AI-based technologies can help coaches monitor athlete's progress, analyze data, and provide actionable insights. One of the most important benefits of using AI in sports training is the ability to analyze data more accurately and quickly. AI systems can analyze data obtained from matches and training sessions and help coaches make better decisions. In addition, AI can also help coaches create personalized training programs for individual athletes. AI can help teams develop successful strategies (Erdil N.G., Gul M., 2023, Spor Bilimlery Ve Egzersizde Butunsel Yaklasimlar).

This study presents a significant challenge to crucial aspect of quality across two distinct translations. Consequently, it offers valuable insights for both students and educators within the English major, allowing them to approach the material with varying perspectives aligned with their specific objectives.

1.4. Research question

1- To what extent could the Persian translator of Exercise and Sport Physiology preserve the adequacy and accessibility based on Toury's model?

2- Is there any significant differences between MT (machine translation) and HT (human translation) procedure by Toury's model?

1.5. Definition of key terms

Machine translation: Machine translation (MT) is the application of computer software to translate natural language from one linguistic variety (source language ST), into another linguistic variety (target language TL). [Arnold, D.J., Balkan, L., Humphreys, R.L., Meijer, S., & Sadler, V. (1994), Machine Translation]

AI (artificial intelligence) Translation: Artificial Intelligence Translation (AIT) is a term used to describe the process of using artificial intelligence, particularly natural language processing and machine learning techniques, to perform translation tasks. [Poibeau T., 2017, Machine Translation]

Comparative study of HT and MT: Comparative studies of human and machine translation analyze the similarities and differences between translations produced by human translators and machine translation systems, focusing on factors such as accuracy, fluency, and overall quality to identify areas of strength and weakness for both approaches. [Babych, B., & Hartley, A., 2004, improving machine translation output through human interaction]

Translation: translation is replacement of one language known as source language with another that is known as target. "the process is usually an interlingual translation in which the message in source language text is rendered as a target text in a different language".

[House, 2009, p.4]

1.6. Delimitation, limitation

Numerous texts exhibit considerable differences when comparing human translation to machine translation. In this study, I will specifically analyze the specialized sports text, ‘Sport and exercise Physiology’ textbook.

One limitation of this project is that it exclusively focuses on specialized sport textbook in order to identify any potential differences between human translation and machine translation.

In this analysis, the context of the textbook is examined through the lens of Toury’s adequacy and acceptability model.

The primary focus of this study is the translated textbook produced by five experts.

Chapter II

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2.1. Introduction

This chapter will explore on the realm of translation studies, with a particular emphasis on the significance of sport in this world. The text ology of sports physiology textbook, which elucidates the unique linguistic, terminological and stylistic aspects of this specialized domain, will be examined. Moreover, and elucidation of artificial intelligence translation and its potential implications for the field will

be provided. Central to this discussion is an exploration of the notions of adequacy and acceptability, as delineated in Toury's model, which are fundamental to achieving a balance between precision and fluency in the translation process. The overarching objective is to enhance our understanding of how to effectively navigate the complexities inherent in translating sports-related content, ultimately facilitating cross-cultural exchange and fostering global comprehension.

2.2. Role of Sport in This World

Health is an invaluable asset that is invaluable to every individual and society. In this modern era, increasingly crowded lifestyles with job demands, dependence on technology, and unhealthy consumption habits have increased serious health problems in various parts of the world (Cook et al., 2003). Amidst this challenges, sport has emerged as one of the important pillars in maintaining public health. Sport is not only limited to physical activity that drains energy, but also is one of the effective means to strengthen and maintain the physical, mental, and social health of individuals in a society. The importance of exercise lies in its positive impact on various aspects of health, and the context of society, the sport has a greater role, namely in preventing disease and improving quality of life. In terms of physical health, exercise has terms endous benefits. Regular physical activity can help maintain a healthy weight, strengthen muscles and bones, and increase endurance. Studies have proven that exercise can reduce the risk of cardiovascular disease, type 2 diabetes, and some cancers. By involving a wide variety of movements and activities, exercise also supports the optimal function of body organs, including the respiratory and digestive systems.

In addition to the physical benefits, exercise also has a positive impact on mental health. Physical activity can stimulate the release of endorphins in the brain, known as "happiness hormones", so they can help reduce stress, anxiety, and depression. Exercise can also improve sleep quality, increase energy, and help sharpen focus on concentration. The social aspect cannot be ignored in the importance

of sports for public health. Sports are often run in groups or teams, allowing for social interaction, solidarity, and support between individuals. This can help reduce social isolation and create strong bonds among community members. In addition, sports promote values such as cooperation, fair play, and discipline, which contribute to the formation of positive character in society. (International Journal of Health, Medicine, and Sports, Vol. 1, No. 4, p.p. 25-28, 2023)

2.3. Text ology of Sport and Exercise Physiology Textbook

The world of sports is an international biosphere because it incorporates multiple sporting events, such as soccer which entail the participation of diverse countries representing dissimilar cultures. As a result, the sporting world is structured to unite people from different cultures and regions, and thus it brings millions of people together for various tournaments. The people involving in sporting activities include athletes, spectators, broadcasting teams, and the sport management teams that facilitate sports events and ensure that the matches are handled accordingly. Integrating diverse groups of dissimilar backgrounds results in language-based challenges due to the need for a common language between the people. The various teams involved in sporting events must communicate and understand each other to ensure the tournaments are held successfully. Thus, the role of sports translators, interpreters and as well audio-descriptive commenters to ensures that the partially sighted or blind fan (listener) has a complete understanding of the match he or she is attending and is able to more fully enjoy the match day experience alongside follow fans. Sporting translation illustrates the interpretation services offered to various participatory teams in the sports industry to promote awareness and sporting events. Given the diverse needs of the parties involved in soccer, such as the need for the athletes to understand the guidelines and the necessity for the

broadcasting media to analyze and report the sport events, different parties have dissimilar conditions that require other translation techniques (Anyawuike O.S.O., 2023, Sport translation and interpreting).

2.4. History of Machine Translation (MT)

With the possible exception of the calculation of artillery trajectory tables (Goldstine and Goldstine 1946), machine translation has a strong claim to be the oldest established research discipline within computer science. Modern translation is a modern discipline, one whose success and very existence is predicated on the existence of modern computing hardware. Yet certain core ideas which would eventually serve as the foundations for this new discipline have roots which predate the development of electronic digital computers.

As we survey the history of machine translation, we find it useful to recall the following quote from Mark Twain: "History never repeats itself, but the Kaleidoscopic combinations of the pictured present often seem to be constructed out of the broken fragments of antique legends" (Twain and Warner 1874). This excerpt from Mark Twain's The Gilded Age: A Tale of Today may be the origin of the modern proverb apocryphally ascribed to Twain. "History never repeats itself, but it rhymes". In 1980, Martin Kay called for a re-examination of the role of humans and machines in the translation process, away from the lofty goal sought by many during the mid-20th century of fully automatic high-quality machine translation, and towards a gradual partnership between human translators and welldesigned computer programs built to modestly assist their human counterparts (Kay 1980). Kay dream in many ways presaged the development of computer-aided translation (CAT) tools that are in wide use today. (Schwarts L., (2016), the History and Promise of Machine Translation, University of Illinois, USA)

2.5. Comparison of HT (Human Translation) and AI Translations

In the progressing discipline of translation studies, the topic of Machine Translation (MT) and how it compares with Human Translation (MT) has surfaced repeatedly as MT has advanced. Historically, HT was mainly done for religious, political, technical, or literary purposes. Different methods of how to translate came about including translating word-for-word versus sense-for-sense and later translating with audience and purpose in mind. Modern day translation includes the use of computerassisted translation (CAT) tools, Translation memories (TMs), and the inclusion of Machine Translation (MT). This has resulted in new types of translation techniques such as localization and post-editing. Early MT approaches after World War II include rule-based systems and eventually the approaches shifted toward data-driven approaches which used existing translations to train machine learning models to translate.

Current state-of-the-art methods include Neural Machine Translation (NMT) and the use of Large Language Model (LLMs) to translate, which are trained using HT data.

Over the years, with all these advances in MT, translators and Mt developers alike have often asked the question *Will MT ever attain the level of quality of HT? or Will MT replace human translators?* The answer to this question is varied. There have been many who have speculated that in just a few years MT will be replacing human translators, and AI replacing humans in other tasks as well. Philipp Koehn stated that "the long-running jocular answer in machine translation to the question, 'When will we reach fully automated high quality machine translation?' is five years" (Koehn, 2020, p. 29). He then later says that eventually the five years pass and all that's been accomplished are broken promises and that actually solving this problem with machine translation has not been in the cards. (Marshall, C.

(2018) A Comparative analysis of human and machine translation quality. Birgham Young University).

2.6. Adequacy and Acceptability Based on Toury's Model

Translation is a kind of activity which inevitably involves at least two languages and two cultural traditions, at least two sets of norm-systems on each level. Thus, the 'value' behind it may be described as consisting of two major elements: (1) being a text in a certain language, and hence occupying a position, or filling in a slot, in the appropriate culture, or in a certain section thereof; (2) constituting a representation in that language/culture of another, pre-existing text in some other language, belonging to some other culture and occupying a definite position within it. These two types of requirement derive from two sources which even through the distance between them may vary greatly are nevertheless always different and therefore often incompatible.

Were it not for the regulative capacity of norms, the tensions between the two sources of constrains would have to be resolved on an entirely individual basis, and with no clear yardstick to go by. Extreme free variation may well have been the result, which it certainly is not. Rather, translation behavior within a culture tends to manifest certain regularities, one consequence being that even if they are unable to account for deviations in any explicit way, the persons-in-the-culture can often tell when a translator has failed to adhere to sanctioned practices. It has proven useful and enlightening to regard the basic choice which can be made between requirements of the two different sources as constituting an initial norm. Thus, a translator may subject him/herself either to the original text, with the norms it has realized, or to the end product. If the first stance is adopted, the translation will tend to subscribe to the norms of the source text, and through them also to the norms of the source language and culture. This tendency, which has often

been characterized as the pursuit of adequate translation, may well entail certain incompatibilities with target norms and practices, especially those lying beyond the mere linguistic ones. If, on the other hand, the second stance is adopted, norm systems of the target culture are triggered and set into motion. Shifts from the source text would be an almost inevitable price. Thus, whereas adherence to source norms determines a translation's adequacy as compared to the source text, subscription to norms originating in the target culture determines its acceptability. (Toury G., 1980, In search of a Theory of Translation)

2.7. Empirical Researchers in the Related Field

Several researchers and scholars have conducted comparative studies on human and machine translation. Here are a few notable individuals and their works:

In 1947, Warren weaver considered the "father" of machine translation (MT), he proposed using computers for translation in his memorandum, initiating the development of MT.

In the early 2000, Josper H. W. van der Meer, conducted studies on machine translation quality and comparison with human translation.

In 2016, Zohra Labed, presents an article seeks to investigate the issue of human as opposed to machine translation challenge through a comparison between human and Google translation.

In September 2011, Jason Lee and Posen Liao, investigated a study about comparative study of human translation machine translation with post-editing. Current MT systems have

technical, linguistic and extra-linguistic limitations, thus their outputs require editing to facilitate the emendations of the artificial or imperfect MT outputs into publishable texts.

Chapter III

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3.1. Introduction

This chapter outlines the methodology employed to analyze potential discrepancies between human and AI translations of the ’Exercise and Sport Physiology’ English textbook, into Persian drawing upon Toury’s norms model framework.

In this chapter, we will delineate the objectives underpinning this research, highlighting the intended contribution and outcomes of this study.

A random selection of sentences and paragraphs from the source text will be inputted into the Artificial Intelligence (AI) machine translation system. Subsequently, the resulting translations will be scrutinized for any notable discrepancies or variances that may arise.

3.2. Source Material

‘Sport and Exercise Physiology’ is a comprehensive textbook authored by Jack H. Wilmore, David L. Costill, and W. Larry Kenney, published in 1994. The book focuses on the physiological principles related to sport and exercise, providing an in-depth understanding of how the human body responds and adapts to various physical activities.

The text covers a wide range of topics, including energy systems, neuromuscular physiology, cardiovascular and respiratory physiology, environmental factors, ergogenic aids, and the principles of training and detraining. It explores the effects of exercise on the human body at different levels, from cellular processes to systematic responses. Additionally, the book delves into the implications of exercise physiology for athletic performance, health, and fitness.
The authors emphasize the importance of applying this knowledge to improve training methods, optimize performance, and enhance overall health. Overall, ‘Sport and Exercise Physiology’ serves as a valuable resource for students, researchers, and professionals in the fields of exercise science, kinesiology, and sports medicine, providing a strong foundation for understanding the physiological aspects of physical activity.

Title	Author/ Translator	Year of Publication	Publisher	Number of Pages
Physiology of Sport and Exercise	W. Larry Kenney Jack H. Wilmore David L. Costill	1994	Human Kinetics	246
آشنایی با فیزیولوژی فعالیت بدنی و ورزش	معینیدکتر ضیا دکتر فرهاد رحمانی نیا دکتر حمید رجبی دکتر حمید آقا علینژاد دکتر فاطمه سلامی	6222	مبتکران Mobtakeran	672

3.3. Theoretical Framework

3.3.1. Toury's Model

Toury starts his article with a thesis that the acquisition of a set of norms is essential for becoming a translator within a cultural environment, so that the translator is able to express the thoughts appropriately, and maneuver between potential constraints. It is said that norms determine the equivalence manifested by actual translations. According to Toury in socio-cultural dimensions, translation is influenced by many types and degrees of constraints. What is more, he claims that since cognition is so influenced, translators working under different conditions use different strategies. As far as constraints are concerned, they can be described using a scale with two extremes: rules and idiosyncrasies. Norms are placed between this two, so they form a graded continuum: some are stronger and closer to norms, while the weaker ones- to idiosyncrasies.

Norms are believed to specify what is tolerated allowed in a certain behavioral dimensions, ensure the retention of social order and are acquired by each person during his or her socialization. This is why translation involves at least two sets of norms- systems when it concerning translation: preliminary and operational. There is also another division he mentions: 1. Basic (primary) norms, 2. Secondary norms or tendencies and 3. Tolerated (permitted) behavior, and a special group detachable from the third one – Symptomatic

To conclude, Toury states that the art of translation involves a set of norms as well as the translator's intuition and alertness in adjusting his or her choice to the context. [Toury G., (1995), The Nature and role of norms in translation].

3.4. Design of Study

Quantitative	Qualitative
The quantitative aspect of this research involves evaluating and measuring the accuracy of both AI and human translations using established criteria, such as adequacy and readability, to provide a comprehensive analysis of their performance.	The qualitative dimension of this study encompasses an in-depth examination of the contextual elements, quality of the translations. This aspect incorporates crucial factors such as cultural adaptation and the accurate application of sport and scientific terminology.

3.5. Procedure

Five paragraphs were randomly selected from the source textbook, starting from chapter one, to serve as a sample for comparison. Due to disparities in page numbering between the source text and the translated version, direct page-to-page correspondence was not feasible. Upon initial perusal, the selected paragraphs were subsequently subjected to Artificial Intelligence (AI) translation. The resulting AI-translated excerpts were then analyzed with their target text counterparts in a comparative sample chart, enabling a detailed analysis of the differences between the source and target texts.

3.6. Data Analysis

Source text	Target text	AI translation

Adaptation to aerobic training: Improvements in endurance that accompany regular. Aerobic training, such as running, cycling, or swimming, result from multiple adaptations to the training stimuli. P. 248 P. 6	:سازگاری با تمرینات هوازی تمریناتی پیشرفت هایی که با نظیر دویدن آرام یا شنا کردن در ظرفیت استقامتی بدست می آید بعلت سازگاری های ناشی .ص از تمرین است171پ 3	بهبود :برنامه آموزش ایروبیک طول دوری که با آموزش ایروبیک منظم مانند دویدن - سوارکوهی کردن و شنا کردن همراه می شود نتیجه مشترکی های استیمولاز توجه به .آموزشی است
Analysis: Both translations remained faithful to the source text (ST); however, the AI translation encountered difficulties in accurately translating specific terminology, such as the word 'stimuli'.		

Source text	Target text	AI translation
Functional anatomy of skeletal muscle: when we think of muscles, we visualize each muscle as a whole, as single unit. This is natural because a skeletal muscle seems to act as a single entity, but skeletal muscles are far more complex than that. P.29 P.3	:ساختمان و کار عضله اسکلتی زمانیکه ما به عضلات فکر می کنیم تمایل داریم که هر عضله را بعنوان یک واحد منفرد تصور نماییم این طبیعی است زیرا به نظر می رسد که یک عضله اسکلتی در قالب یک ماهیت مجرد عمل می کنند اما عضلات اسکلتی بسیار پیچیده تر از آن .ص تند32پ 5 هس	آناتومی فعالیت عضلات :اسکلتی وقتی به عضلات فکر می کنیم هر عضله را بعنوان یک کل یک واحد تصور می .کنیم این طبیعی است زیرا عضلات اسکلتی بنظر می رسد که بعنوان یک موجودیت واحد عمل می کنند اما عضلات اسکلتی بطور قابل توجهی پیچیده تر از این هستند .
Analysis: In accordance with Toury's model of translation adequacy, AI translations demonstrate a higher level of preserving adequacy when compared to target text TT translations. TT translations generally considered more acceptable than AI translations within the context of Toury's model.		

Source text	Target text	AI translation
Fatigue and its causes: what exactly is the meaning of the term fatigue during exercise? Sensation that individuals call fatigue are markedly different when a person is exercising to exhaustion in events lasting 45 to 60s, such as the 400m. run, than during prolonged exhaustive muscular effort, such as marathon running. P.128 P. 1	معنای دقیق واژه :علل خستگی ی خستگی به هنگام ورزش چیست؟ احساس خستگی در فعالیت وامانده سازی مانند دو 422متر که 45تا 22ثانیه به طول می انجامد بطور روشنی متفاوت از احساس خستگی ت که در جریان فعالیت های اس دراز مدت وامانده ساز مانند ص. ماراتون تجربه می شود 137پ 1	معنای دقیق :خستگی و علل آن اصطلاح خستگی در حین ورزش چیست؟ احساساتی که فرد از خستگی نامبرده می شود هنگامیکه یک فرد برای خسته کردن در رویدادهای با طول زمان 45تا 22ند ثانیه مان دویدن 422متری بسیار متفاوت از هنگام تلاش های ی پایان مانند دویدن اسکلتی ب ماراتون است
Analysis: Both translations demonstrate adequacy by remaining faithful to the source text (ST). However, the target text (TT) translation exhibits a higher level of acceptability compared to the alternative translation.		

Source text	Target text	AI translation
Hormone Actions: Because hormones travel in the blood, they contact virtually all body tissues. How, then, do they limit their effects to specific target? This ability is attributable to the specific hormone receptors proceed by the target tissues that can bind only specific hormones. P. 94 p. 2	با توجه به :اعمال هورمون ها اینکه هورمون ها به وسیله ی بنابراین خون منتقل می شوند می توانند به معنای واقعی با بافتهای بدن در تماس تمامی پس چگونه اثرات آنها به .باشند مجموعه ای از اهداف خاص خلاصه می شود؟ این توانایی ناشی از وجود گیرنده های هورمونی ویژه ای روی بافت ص .های هدف می باشد142 پ 4	از آنجایی :اقدامات هورمون ها که هورمون ها با طوری به تمامطور خون راه می افتند با .بافت های بدنی ارتباط دارند در این صورت چگونه می توانند اثرات خود را به بافت های هدفمند محدود کنند؟ این توانایی به دلیل رسید های هورمون منفرد توسط بافت های هدفمند است که فقط می توانند به هورمون های .مشخصی پیوند داشته باشند
Analysis: The AI translation is considered adequate but lacks acceptability, while the target text (TT) translation manages to achieve both adequacy and acceptability within the context of Toury's model.		

Source text	Target text	AI translation
Pulmonary ventilation: pulmonary ventilation or breathing, is the process by which we move air into and out of the lungs. Air is typically drawn into the lungs through the nose, although the mouth must also be used when the demand for air exceeds the amount that can comfortably be brought in through the nose. P. 164 p. 3	تهویه ریوی که :تهویه ریوی تنفس نامیده می شود "معمولا فرآیندی است که هوا به داخل و خارج ریه ها حرکت می کند. هوا از طریق بینی "معمولا وارد ریه ها می شود البته اگر نیاز به هوا بیش از مقداری باشد که به راحتی از راه بینی اق شود باید از دهان هم استنش ص .استفاده کرد665پ 3	تنفس پلمونی یا :تنفس پلمونی نفس کشیدن فرآیندی است که با آن هوا را به ریه و از آن به "هوا معمولا .بیرون می آوریم از طریق بینی به ریه ها کشیده اگر مقدار نیازمندی .می شود به هوا از مقداری که می توان یق بینی به ریه با آسایش از طر ها وارد کرد بیشتر باشد باید از .دهان نیز استفاده کرد

Analysis: In comparison, the target text (TT) translation exhibits higher acceptability than the AI translation, although both translations can be considered adequate in terms of preserving the meaning of the source text.

3.7. References

Marshal C., Comparative study of HT and MT, Birgham Young University

Toury G., (1995), Descriptive translations studies

Toury G., (1995), The Nature and role of norms in translation

Toury G., 1980, In search of a Theory of Translation

Schwarts L., (2016), the History and Promise of Machine Translation, University of Illinois, USA

Anyawuike O.S.O., 2023, Sport translation and interpreting

International Journal of Health, Medicine, and Sports, (2023),Vol. 1, No. 4

Erdil N.G., Gul M., (2023), Spor Bilimlery Ve Egzersizde Butunsel Yaklasimlar