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What is the Cost of Silence: Examining the Drawbacks of the In-class Participation Grading Method in American K-12 Schools By Ricky Zhou

Abstract

The in-class participation grading method measures a student's quantitative engagement in classes. The participation grade is often combined with other gradings and makes up the Grade Point Average. Numerous flaws exist within the grading system. While it is used worldwide, only the schools in the United States will be considered in this paper. The essay examines and discusses the drawbacks of the method and provides plausible alternatives.

Keywords

developmental psychology, education, participation, personality, grading methods

Introduction

Suppose you are a student who doesn't really feel like talking much, whether in class discussions or in daily lives. You always dedicate yourself to every single assignment and test. When you receive your final report, however, you find that you get an A- for a class. You are confused, since based on your calculation, your grades should be in the A range. You rushed to your teacher's office and asked her why you didn't get what you deserve. She says to you: 'You speak too little in classes, so I don't feel you are engaging with or understanding the class content, which is why I lowered your in-class participation grade.' You try to speak for yourself, but you realize that you cannot argue with her since you have no evidence or record. You *can't* do anything. You are *penalized* for your silence by the in-class participation grading method. Even though the grading method is widely used by middle and high schools in the United States to assess a student's participation, the method on its own may not be a fair and inclusive way to accurately reflect a student's actual engagement and understanding of the class content.

Discussion

Students are unique when it comes to absorbing knowledge, and they have different ways in which they feel comfortable participating in class. They carry varying personalities that affect the willingness to participate during classes. A student might possess a more outgoing and

talkative personality while another could be demonstrating a relatively more reserved one. These factors, therefore, also result in different learning styles. Students with certain personalities such as shyness are more prone to listen to the class and the thoughts of their following peers, rather than speaking up themselves. Often, the in-class participation method can be intimidating and biased towards students who have more introverted personalities (Mello, 2010). These students do not possess the same degree of willingness to speak up during classes like the students that are more comfortable voicing their thoughts. An unfortunate consequence of this problem might be that graded participation does not build the ability of learning, but rather, it rewards those who prefer and are comfortable verbalizing what they have learned (Mello, 2010). Therefore, it is imperative to make sure that every student is placed in a learning environment in which they feel comfortable in order to achieve their maximum learning outcome. Students with personalities that don't align with the grading method will bear an unfair disadvantage when the teacher grades them, because speaking up in classes is the only way in which a student's participation can be observed and assessed by the teacher. The teacher, in order to be as objective as possible, will try to recall the frequency this student participated during class, and the amount of frequencies are highly subjective to memories (unless the class was archived or recorded—via Zoom, perhaps). The student's rooted personality will not be considered as a factor when it comes to grading. Therefore, even though students understand the class content, their way of showing the ability to learn is limited by their diverse personalities.

While the teacher might not consider an individual student's personality as a factor when grading participation, this method also brings about student behavior that may be inflating their true understanding of the content. This further jeopardizes the objectivity of the grading method. It would be vital to discuss the fairness and the inclusivity of the in-class participation grading method. Each student has a unique way of interpreting the grading method. Once students realize how the grading method works and wish to obtain high grades, some will try to draw their teachers' attention and speak up frequently, even though they do not necessarily have a thorough understanding of the class content. For instance, they might compose unorganized thoughts and impose knowledge that is common sense-both of which are not considered effective contributions to the class. Their 'participation' is of low quality, but they nevertheless obtain high grades for their 'common engagement' in classes. There is a difference between genuine effort and eager appearance in classes. A student might participate actively, either because he or

she has a genuine interest in the course or because the student simply wants to achieve high participation grades (Kelly, 2008). Both types of participation seem to be active, but only the first type can be considered as true active learning. The students who participate only for the grades are not necessarily demonstrating their interest, but the teacher might not notice or consider the difference between the two types of participation, and will still favor students “who appear attentive and aggressive during class... not because they have learned more material but because they have learned to act like they are learning more” (Kelly, 2008, p35). In summary, the grading method causes students to focus more on the quantity rather than the quality of their engagements (Mello, 2010). If students continue to value quantity over quality, their ability to develop critical thinking skills might be hindered. As a result, very little value is added to the class by each student under the in-class participation rubric. Another flaw of the in-class participation method is it creates an unfair share of air during class discussions. Some students would compete for the air time during class discussion, hoping to be noticed by the teacher more, thereby gaining a higher participation grade, but their actions create an unequal distribution of opportunities for the others to speak up. The silenced ones are likely to be ignored by the teacher and receive a relatively lower participation grade. The continuous competition for speaking up in classes molds a high-pressure, participation-intensive class atmosphere (Mello, 2010). These problems created by the grading method are less impactful in private schools, since classes are usually smaller, hence more compact. While in larger classes in public schools, the competition for air time renders some students not able to speak up and get noticed by the teacher at all (Mello, 2010). The toxic environment forces some to fight for air time to avoid being ignored. Not only from the students’ perspective is the grading method unfair, it is also subject to bias from the teachers’ perspective. Teachers, whether knowingly or unknowingly, might favor individuals in the classroom with certain characteristics or personalities. For example, teachers could unconsciously favor more lively students who talk more and implicitly disapprove shy students who don’t engage much in classes. In another way, they could unintentionally develop either positive or negative impressions on different students. Therefore, teachers might offer a higher participation grade to those who are more favored when they grade their participation, since they are linked to a more positive impression. The in-class participation grading method may lend itself to more bias than grades for daily assignments, projects, essays, and presentations. There are bias in grading all forms of assignments which are bound to happen, and

it is not quite possible for the students to dispute their participation grades after the teachers grade them, since there is no evidence of record or archive of the class, unless the class takes place in online environments (such as Zoom), which could be recorded and reviewed later (Mello, 2010). The gradings are mainly based on the teacher's memory from classes, which can be influenced by many factors including other classes they teach. Some teachers, in order to hold a more smooth and effective class, would intentionally pick on students who are more 'capable' of conducting discussions and answering questions. With the extra attention the teacher pays to cooperative students, they would receive an automatic boost from the teacher to their participation grades (Kelly, 2008). These biases are, again, inevitable. However, they are still unfair. When teachers continuously call on more cooperative students, they might at the same time frustrate the confidence and willingness of other students to participate in class. A perspective more inherent to the student that highlights the flaw in the grading method is cultural barriers. For international students who have different cultural backgrounds, countries of origin, and native languages, their perception of class-participation differs. The education system in which they grew up might promote different learning strategies, which would shift students' personalities and in-class behaviors. Students who do not speak English as their first language may not feel confident when speaking up, which could jeopardize the frequency and willingness of in-class participation. For students from cultures that do not intentionally grade or promote class participation such as those in East Asian societies, they will experience a great disadvantage when they attend schools in the US after they were educated in their native cultures. For example, Confucianism in Asia regards teachers as 'givers of knowledge' and believe that all students need to do is to absorb the knowledge gifted by the teacher. Therefore, students' strict respect and reverence to the teachers would decrease their willingness to participate in class discussions and challenge the teacher (Mello, 2010). Furthermore, students from cultures that are regarded as 'minorities' might have relatively less courage to express their unique views that don't necessarily agree with the 'mainstream belief'. The minority students, especially those of color, could feel that their words and ideas are not accepted by the teacher or their fellow peers. They might be reluctant to express their own ideas and feelings as individuals, since there is a possibility that their opinions could 'offend' others and go directly against the 'dominant system.' They would assume that they are expected to 'speak for the entirety of their cultures' experiences.' (White, 2011). The cultural barriers, just like personalities, are rooted in

students and cannot be easily altered. Without accommodation from the teacher or the in-class participation grading method itself, their grades may be lower than those of their classmates.

From a psychological standpoint, mandatory participation induced by the grading method could also affect students' emotional well-being. The middle and high school years bring about the developmental period of adolescence which in some, puts them more at-risk of mental health issues, such as anxiety. In order to avoid potential judgements from others, students might not be willing to speak up and participate in classes. For example, students might want to resolve a question asked by the teacher during class, but are terrified by the belief that every word will be carefully assessed by the entire class as if they were presidents. The extra caution to answer the question yields extra pressure and decreases the willingness of this student to participate. Pressure causes great discomfort, particularly for students who have social anxiety. If they wish to get a higher participation grade, they may experience uneasiness in doing so. Students are 'constantly worried about looking foolish in front of others' (Norlock, 2016, p486). Many physical symptoms such as a rapid heart rate, trembling, blushing often accompany social anxiety. These symptoms apply to daily participation in class discussions, and they escalate when it comes to tasks such as individual presentations. A student with social anxiety could spend an entire semester not actively participating in oral discussions, unless being asked to do so (Norlock, 2016). Therefore, students who experience social anxiety may end up with a lower grade. Not participating in classes doesn't necessarily mean that a student is not paying attention or not understanding. A student could have legitimate mental health issues that prevent them from participating with ease. One other way to examine students' mindsets during classes is to take their individual self-esteem into account. Self-esteem refers to the 'set of evaluative attitudes that a person has about him/herself or his/her achievements' (Morrison & Thomas, 1975). It is derived from each student's personal beliefs, experiences, and opinions regarding a matter. Self-esteem, coupled with resiliency, often determines one's intention to participate in a discussion or not. While some students have stronger self-esteem and are not afraid of judgements and failures when participating, others might have more fragile self-esteem to rejection or criticism, which could drive them to intentionally avoid participating. Studies have shown that students who have fragile self-esteem tend to crave for a greater amount of personal space (Morrison, Thomas, 1975). Participating in classes would undoubtedly decrease their personal space because they would be addressing a larger group, which is the opposite of what

they crave for. Students with low-esteem, in order to avoid being uncomfortable, would intentionally ‘suppress their expression of thoughts or questions’ while in classes (Morrison & Thomas, 1975, p377). However, low-esteemed students not speaking up sufficiently does not mean that they are not delivering their ideas. Research done by Morrison and Thomas indicated that students who are of high-esteem, in comparison to a group with low self-esteem, only contributed less than half of the main thoughts, and the total amounts of thoughts contributed by each group had no significant difference. The study showed that low-esteem students tend to maintain their distance with others in classes in order to maintain their maximum learning capability. Their seemingly insignificant contributions, however, are of good quality and should not be penalized for their fear of speaking up.

While the unfairness and exclusiveness of the in-class participation grading methods have been examined and discussed, proponents of this method could say otherwise. After all, the grading method has been an essential part of the US education system for many years and as such, its advantages and usefulness should be acknowledged as well. Students’ in-class engagements, promoted by the grading method, teaches themselves to advocate for themselves and communicate effectively. By actively participating in classes, students will be able to master life skills that are vital not only for their daily lives, but also indispensable for their future workplaces. For instance, students might be asked to conduct a group debate session during class, which requires them to continuously communicate with their peers and cooperate effectively. The skills obtained by participating in classes could allow students to thrive at their future jobs when they are, for example, communicating with their clients, demonstrating statistical presentations, and interviewing others utilizing the grading method. They could furthermore benefit students’ ability to socialize with their peers and their teachers as well. The acquisition of these skills is, in part, what education is about. To educate students is not to fill their brains with mere knowledge, conceptual changes that affect basic life skills are what they need. In addition, students’ interactions with the teacher when participating in class enable them to build their experience of problem solving with adults, which is useful when students grow up in the society (Dancer & Kamvounias, 2005). In order to succeed in their future careers, it is best for the students to be prompted by the in-class participation grading method. As their frequencies of contributing to the class increase, their essential life skills strengthen. Moreover, students would need to have the courage and know the optimal way of expressing their own opinions. For

example, if a person's rights are infringed, he would have to possess the ability of advocating for his own rights. The ability can be acquired through participating in classes. Students often hold opposite views during class discussions. However, not all of them have the ability, or courage, to express their views and challenge others. Under the in-class participation grading method, students would be encouraged to share their voices with the class, so their courage to speak for themselves accumulates over time. Participating in classes can transform students into decision-makers and controllers of their own lives (Johnston & Ivey & Faulkner, 2011). When the students are encouraged to propose challenging views, they think about it logically before they speak and they will choose what to say and what not to say. They would develop the ability to bravely stand up for and protect the things they value. Students will understand that for each action there are following consequences when they are prompted by the grading method (Johnston & Ivey & Faulkner, 2011). The courage of self-advocating can be applied to a variety of real-life scenarios. By developing the courage and using the logical way to argue, students can prevent themselves from being unjustly treated.

Conclusion

All in all, the in-class participation grading method fails to include students' inherent personalities and learning styles as factors. Students have diverse abilities and may not be assessed based on one single rubric. Learning is an active process, not a passive one. Education is effective only when students have personalized and comfortable ways of learning. In addition, the grading method is not inclusive because teachers are often subjected to their bias when grading students' participation. Some students, on the other hand, also have their own interpretation of what participation means to themselves, which could result in low-quality responses and unfair share of class time. This results in teachers rewarding students who talk the most, rather than acknowledging those who effectively make contributions to the entire class progress. Social anxiety and self-esteem also impact students' willingness to engage during class by speaking up. Such reasons can also be taken into account when grading in-class participation. Meanwhile, benefits of this grading method exist. The grading method sets up students for success in the future by pushing them to develop important life skills. These skills can enhance students' speaking, socializing, and reasoning abilities.

While the in-class participation grading method is flawed, modifications can be made to make it more inclusive and fair. Some alternatives, or add-ons to the grading method could be beneficial. The think-pair-share (TPS) teaching strategy advocated by Mundelsee and Jurkowski is an effective way to accommodate students (especially shy students) in K-12 schools with different personalities to participate comfortably. Under this strategy, students are first asked to think regarding a given topic or task. Then, each student will be paired up with another student to share their thoughts with each other. Finally, students will be able to share their extended, or refined findings with the larger class. Students feel safe when they are addressing a smaller group, and this strategy allows them to have enough time to compose their ideas. These ideas are also usually of good quality, since they are thoughts that have been combined and validated by a partner.

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Vocational Training Styles for Individuals with Autism Spectrum Disorder

By Courtney Wong

Abstract

The ability to gain and maintain positions in the workforce is an important part of the transition from adolescence to adulthood, this is crucial for neurodiverse students and young adults. Individuals with Autism Spectrum Disorder (ASD) may need additional support during this transition as they face more challenges than a neurotypical person. These challenges include the interview process, communicating with peers/colleagues, and striving for successful outcomes all while doing so. Therefore, this review will explore what the most effective ways are to implement vocational focused training to prepare teenagers and young adults with ASD for success in work performance during the transition to adulthood. I will investigate by reviewing 9 articles related to this topic.

Introduction

Autism Spectrum Disorder (ASD) is a lifelong neurodevelopmental disorder that ranges from mild to severe. To be diagnosed with ASD, an individual must exhibit two difficulties: social communication restricted/repetitive behaviors or sensory behaviors (Centers for Disease Control and Prevention, 2022). Vocational training is a specialized training of skills for individuals who are preparing for a job that requires such skills (Training Industry, 2018). Past research findings revealed that improved outcomes in education, employment, and independent living for students with ASD who participated in employment experiences during high school (Bross et al., 2019). On the other hand, certain styles of training are more effective than others. Cue training offers a stronger alternative than past behavior skills training programs (Burke et al., 2010). The majority of individuals with ASD are unemployed due to the lack of skills needed to succeed in the work industry. Additionally, around 44% of individuals with autism receive post-secondary education (Shattuck et al., 2012). Unemployment rates for adults with ASD will decrease with the rise in practices to support employment. Methods include vocation training interventions targeted to adolescents and adults with ASD to suppress the unemployment rate. Trends in intervention characteristics are emphasized along with recommendations for future research (Seaman et al., 2016).

Methods

I decided to conduct a literature review to address the research question: What is an effective way to implement vocational focused training to prepare teenagers and young adults with ASD for success in work performance during the transition to adulthood? I searched for articles that best addressed the research question by using the following inclusion/exclusion criteria; individuals mentioned fall between the 16-30 age range, includes ASD in the main title and/or keywords, includes any/all 3 levels of autism (mild, moderate, and severe), published between 2010-2021, and peer reviewed. Keywords included Autism Spectrum Disorder, vocational training, employment, career-technical education, interview, job, resume, teenagers, young adults. The search tool I used was PsycInfo and Google Scholar in order to properly apply the criteria. I have narrowed down my search to 9 articles because these articles best meet the inclusion/exclusion criteria and best represent the research question.

Literature Review

Article 1 - Peer-Mediated Intervention

Peer-mediated interventions were implemented on individuals with ASD in a work-based learning setting in high school. Improvements were made based on the social interactions between students with ASD and their peers. PMI consistently increased independent vocational tasks, social interaction, and improved the quality of social interactions for all three dyads (Figure 1).

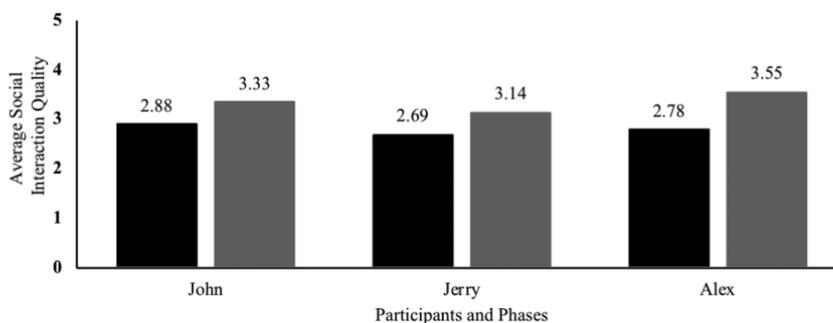


Figure 1 The graph shows the average quality of social interactions per phase for each participant based on a 5-point Likert Scale developed by Carter et al. (2005). Figure and caption

from Athamanah, L. S., & Cushing, L. S. (2019). Implementing a Peer-Mediated Intervention in a Work-Based Learning Setting for Students with Autism Spectrum Disorders. *Education and Training in Autism and Developmental Disabilities*, 54(2), 196 –210. Retrieved July 29, 2022, from. The purpose of the study was to investigate the impact of peer-mediated interventions on the engagement of independent vocational tasks and social interactions of transition-aged students with ASD and their peers in work-based learning settings. Findings indicated that the peer-mediated interventions consistently increased independent vocational tasks, social interactions, and improved the quality of social interactions for all three dyads. Further research is needed on how peer-mediated interventions can be integrated into a high school setting to promote social interactions between students with or without ASD.

Article 2 - Modeling

Video modeling interventions will impact the customer service skills of students with ASD involved in the employment process or are employed. Step-by-step guidelines are provided for practitioners for video modeling interventions that are used as support in the workplace. Students with ASD can benefit from instruction in customer service skills through video modeling interventions. Acquiring these skills is important for all professions as communicating with customers is crucial (Bross et al., 2019).

Article 3 - Cue Training

Cue training was used to improve skill retention for adults with ASD (fire safety training). A Performance Cue System (PCS) is a visual cueing system designed to prompt the participants to complete tasks. Behavioral Skills training (BST) is a combination of both performance and competency with a particular skill, or set of skills. BST often includes cueing, but this study developed an application for the learners to use independently without an instructor to assist with cueing for task completion (Burke et al., 2010). On its own, PCS can help individuals with ASD successfully apply complex skills in work environments (Burke et al., 2010). Cue training was more effective alone than behavioral skills training alone. After the introduction of the cue system, 5 of 6 of the participants reached criterion (Burke et al., 2010). The participants, parents, and consumers highly rated the program.

Article 4 - Adaptive Behavior Scales

A longitudinal study was conducted with 98 adults with ASD when they were 2 to 26 years old. Vineland Adaptive Behavior Scales were administered 8 times. Employment and education data was collected in this study with parent report demographic forms. The results indicate that DLS-AE trajectories increased with age before exiting school where DLS-AE trajectories peaked but began to decline after (Clarke et al., 2021). DLS are shown to be important for adults with ASD after high school. Future endeavors beyond high school require these skills (Clarke et al., 2021). DLS are shown to be important for adults with ASD after high school according to the data. These skills will become important in future endeavors beyond high school.

Article 5 - School Program Integration

The program's intent is to prepare them for the transition from high school to employment and post-secondary education. Starting at 9th grade, the program focuses on literature recommendations, inclusion, co-teaching, work skill classes, collaboration with outside agencies, and the development of a student portfolio (Eastman et al., 2021). The program proved to impact the students because more who participated in the program graduated from high school enroll in a college than students who did not participate in the program (Eastman et al., 2021). 67% of the program's students were enrolled in a postsecondary education institution. In 2020, all of the students attending college also had mostly full-time jobs. (Eastman et al., 2021). The program's students have benefitted from this type of intervention. With a transition program that is focused on skills on the post-school stage, students with ASD are able to further immerse in their respective interests while gaining quality education (Eastman et al., 2021).

Article 6 - Errorless Teaching with Prompt Delay

Four adolescents with ASD were taught a problem-solving strategy to improve the ability to complete vocational tasks independently in three types of problems and non-problem situations. Results revealed that all four participants have independently completed the tasks when a problem was presented and responded to untaught vocational tasks. Following the introduction of problem-solving training, performance increased for all participants to mastery level proving that adolescents with ASD to using an activity schedule dedicated to solving common vocational task problems was effective (Lora et al., 2019). The table below reveals that all four individuals showed full mastery of maintenance post-training.

Participant	Baseline for problem solving	Post-Problem solving training
Alex	2%	Full Mastery with Maintenance
Jacob	2%	Full Mastery with Maintenance
Kristina	0%	Full Mastery with Maintenance
Travis	4%	Full Mastery with Maintenance

Figure 2 The table represents that all participants benefited from the training.

Article 7 - Rehearsal

Does written, and verbal rehearsal improve performance in job interviewing? The InterviewStream© program was tested on adults with ASD. Participants reported higher confidence levels after completing the training (Rosales et al., 2019). In the graph below, all participants showed a higher score percentage for the follow-up compared to the pre-training, indicating that the training program benefited the participants to have positive outcomes in job interviewing.

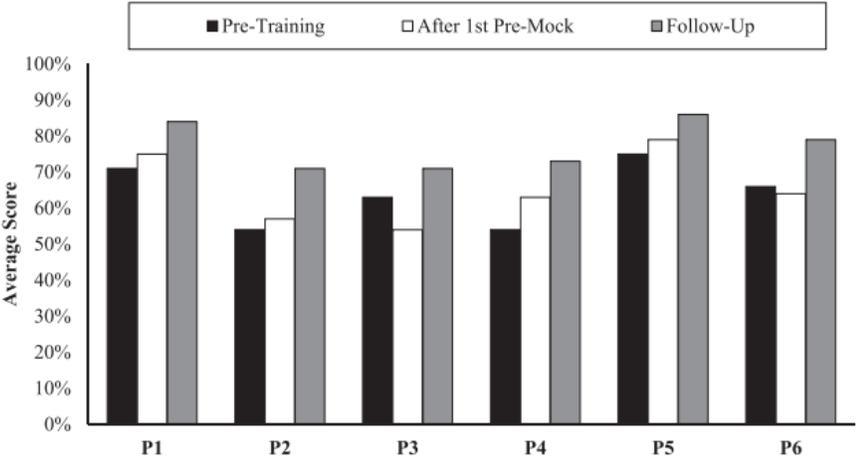


Figure 3 The bar graph depicts self-confidence scores for P1-P6 during all phases of the study.

Figure and caption from Rosales R, Whitlow H. (2019). A component analysis of job interview training for young adults with autism spectrum disorder. *Behavioral Interventions*, 34(2), 147–162. Retrieved July 29, 2022, from <https://doi.org/10.1002/bin.1658>

Article 8 - Virtual Reality Training

A brief survey that was conducted with 23 of 26 participants from this study to evaluate their vocational outcomes on whether they have a competitive position whether employment or competitive volunteering. The data suggested that VR-JIT trainees had a greater chance at attaining a competitive position than the control group (Smith et al., 2015).

	N	Control group (n = 8)	N	VR-JIT group (n = 15)	χ^2/T -statistic
Weeks looking for a position (job or volunteer) mean, SD		16.3 (10.9)		13.5 (12.2)	-0.5
Interviews completed (job or volunteer) mean, SD		1.9 (2.8)		2.1 (2.2)	0.2
% of subjects who completed an interview (job or volunteer)	5	62.5 %	12	80.0 %	0.8
% of subjects who received an offer (job or volunteer)	4	50.0 %	9	60.0 %	0.2
% of subjects who accepted a position (job or volunteer)	2	25.0 %	8	53.3 %	1.7 ⁺

⁺ $p < 0.10$

Figure 4 The table shows a sixth month follow-up between group differences on vocational outcomes. Figure and caption from Smith, M.J., Fleming, M.F., Wright, M.A. (2015). et al. Brief Report: Vocational Outcomes for Young Adults with Autism Spectrum Disorders at Six Months After Virtual Reality Job Interview Training. *J Autism Dev Disord*, 45, 3364–3369. Retrieved July 29, 2022, from https://dpl6hyzg28thp.cloudfront.net/media/Vocational_Outcomes_Smith_2015.pdf

This indicates that VR-JIT is effective at improving the vocational outcomes among adults with ASD (Smith et al., 2015). Using this intervention can be beneficial for individuals who are planning to apply for a job that requires an interview.

Article 9 - Parent-Mediated System

Effects of work systems including the increase of independent task initiation and completion of tasks will improve the functional independence skills of individuals with ASD. Three adolescents with ASD participated in a study which examined the effects of parent-implemented work systems to increase independent task initiation and completion of tasks in home settings. The results showed that parent-implemented work systems are effective at increasing the task

initiation and completion of everyday tasks. All of the participant’s parents felt that the procedures supported their child in the completion of tasks at home and in school (Sreckovic et al., 2020).

Conclusion/Discussion

Article	Intervention Type	Measure	Findings
Athamanah et al., 2019	<i>Peer-mediated</i>	Engagement and independence	Independence and engagement increased during vocational tasks.
Bross et al., 2019	<i>Modeling</i>	Customer service skills	Modeling increased skill retention in most participants.
Burke et al., 2010	<i>Cue training</i>	Skill retention	Cue training correlated with higher proficiency over time with skill retention.
Clarke et al., 2021	<i>Adaptive Behavior Scales</i>	Daily Living Skills (DLS)	DLS increased with age until exiting high school and then faced a decline with age.
Eastman et al., 2021	<i>School program integration</i>	Post-high school outcomes	Increasing programs in high school leads to more positive post-school outcomes .
Lora et al., 2019	<i>Errorless teaching with prompt delay</i>	Completion of untaught vocational tasks	The intervention increased the ability to complete untaught tasks for all participants (N=4).
Rosales et al., 2019	<i>Rehearsal</i>	Interview skills	Participants self-confidence increased .
Smith et al., 2015	<i>Virtual Reality (VR) training</i>	Vocational outcomes	Trainees with VR training had a higher chance of attaining a competitive position.
Sreckovic et al., 2020	<i>Parent-mediated</i>	Independence (in-home)	Parent-mediated interventions increased independence in the home.

Figure 5 The table organizes what type of intervention was mentioned in the articles, the measure the study focused on, and findings resulting from the studies.

From analyzing the 9 articles, it can be concluded that all the interventions stated above are portrayed to be effective in improving the outcomes on the transition to post-secondary school and/or the workforce. This is because the goals of these interventions were for individuals with ASD to develop and/or improve skills that are essential in adulthood and education. Therefore, all the interventions resulted in improvements of various forms of skills from individuals with ASD. High function ASD is underrepresented throughout the studies that we have reviewed in these articles and should be taken into consideration for future interventions regarding vocational training. Individuals with high function ASD are overlooked and usually not included in these studies. By adapting to a more inclusive experiment/study, researchers will be able to observe effective outcomes that are better applied to a wider range of individuals on the Autism spectrum. However, only a few individuals with ASD participate in studies mentioned by the articles, leaving behind a larger population that lack access to vocational training resources and would miss these opportunities because they aren't aware. Preparation for adulthood is a major step in life, and the vocational training is intended to aid in this change will benefit the youth with ASD.

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Fish Response to Shark Presence By Kexiang Huang

Abstract

This experiment examined how fish in the Atlantic Ocean responded to the presence of sharks. The hypothesis was that fish numbers would decrease when sharks were present and their movement would be reduced in order to avoid predation and being easily spotted. Data was recorded through underwater cameras located under the frying pan tower near Cape Fear, North Carolina. Over the course of three days video images were paused and rough estimates of the number of fish were recorded, both when sharks were and were not present, as well as notable behaviors. Comparison of the data shows that fish numbers increased on average 83% when sharks were introduced. There was no correlation between movement and presence of sharks. As a result, the hypothesis was not supported. However, unexpected behaviors such as shoaling/schooling were evident which may provide new insight into some of the strategies fish use to respond to predators. Overall, this experiment yielded unexpected results but new information.

Introduction

Fish have a variety of responses to predation, which include: hiding, forming shoals, reducing movement, swimming to safer waters, and many others..¹ This research examines how groups of fish in the Atlantic ocean respond to the presence of sharks. As sharks are common marine predators, studying how fish respond to them provides a good model for some of the interactions that happen between predators and prey in the ocean. I predict that when sharks are present there will be fewer fish, as these fish will attempt to avoid predation. In addition, I also predict that fish will reduce their movement to avoid being easily spotted; as sharks are known to have poor eyesight. According to an experiment done by Tang Zhong Hua in which the behavior of the black carp (*Mylopharyngodon piceus*) and the snakehead (*Channidae*) were observed respectively as predator and prey, the study found that prey fish “spent substantially less time moving and exhibited an overall shorter total distance of movement after the predator was introduced”. The study also found that “the distance between prey and predator fish significantly increased by approximately 10 cm”.² As a result, I have come to the hypothesis that fish would exhibit similar behavior when in the presence of sharks as they are in a similar predator to prey

¹ “Fish Behaviour.” Fishxperts, 6 Sept. 2019

² Tang, Zhong-Hua, et al. “The Behavioral Response of Prey Fish to Predators”

relationship. However, there are other factors that complicate this seemingly simple response. As an adaptation to sharks' poor eyesight, they have developed the ability to detect heartbeats through sensory organs that allow them to sense the electric current surrounding them, allowing them to detect prey without vision.³ As a result, fish might have new unexpected strategies to deal with sharks in that aspect, and this research will allow me to determine if any of these strategies can be observed. Overall, this research will provide insight into some of the strategies that fish use to avoid predation.

Methods

Fish behavior was observed through a live camera in the Atlantic ocean accessible from the website: explore.org/livescams/oceans/shark-cam. The camera is situated near Cape Fear in North Carolina under the Frying Pan Tower. Two graphs were created and data was recorded between August 28-Sept 1 2020. Each day, video images were paused and a rough estimate of the number of fish on screen, as well as notable behaviors such as scattered, grouped together, swimming fast, swimming slow, etc. were noted. Data were collected every half an hour at different times of the day over the course of three days when sharks were not present. This gave a good idea of the number of fish that could be expected at a given time in the day which is useful when comparing information. Time of the day was taken into account as it may affect the amount of fish in the environment. Additionally, another set of similar data were collected when sharks were present. Since sharks did not appear on camera at all times, I tried to record data whenever possible. The fish's behavior when sharks were around was recorded in the same fashion. The two separate data collected were then compared, being careful to compare data from similar times of the day as time may affect fish numbers.

One issue noticed was that cameras were oriented at different spots throughout the day which could impact the accuracy of the data. At times, the camera was oriented towards the sea floor which resulted in almost no fish being able to be spotted; I was careful to note when discrepancies to the data may have taken place. Another issue that occurred was limited data on sharks. There were only four incidences of sharks throughout the timeframe of the study, two of them which were from highlights. I noticed that sharks appeared at later times of the day

³ Rory Arnold Earth.com staff writer. "How Sharks 'Hear' Their Prey's Heartbeat, and Why It's Important • Earth.com." *Earth.com*, 8 Mar. 2017, www.earth.com/news/sharks-hear-preys-heartbeat-important/#:~:text=Try%20not%20to%20panic%2C%20but.%2Dsensitive%20electro%2Dsensory%20organs.

sometimes even in the middle of the night. Therefore, it became difficult to compare data from both graphs as sharks appeared at such different times.

Results

When sharks appeared, there was about an 83% increase in the number of fish. There was also a clear correlation between shark presence and the behavior of shoaling. Shoaling means schooling, which is when large amounts of fish gather in groups in a coordinated manner. Shoals were spotted during each encounter with sharks. The shoals remained closed to the sharks and seemed to be circling around the camera view. I also noticed that when sharks left, the shoals almost instantly dispersed. Although the sample size remains limited, the correlation is evident from the data. The speed of the fish on the other hand, was rather spontaneous and seemed to have no correlation with shark presence. Below is the statistical analysis.

Table 1: Incidence of Sharks during the timeframe of the study

Time when Sharks Appeared	Number of Fish Spotted	Observations
8:00 pm 8/29/2020	200	Two sharks were spotted on screen, followed by large amounts of fish swimming together in shoals circling the shark. When the shark disappeared, the shoal dispersed.
1:00 am 8/31/2020	100	This time not as many fish but similar behavior of the fish was noticed. Shoaling and remaining in close proximity to the shark was most notable.
5:30 am 9/1/2020	170	This data actually comes from a highlight, which helps

		contribute to the limited sample size. The shark appeared at midnight around 5:30 am when I was sleeping. Shoaling was once again noticed; fish were also swimming significantly faster compared to the other instances.
11:15 pm 9/1/2020	300	Same behavior as noticeable prior. Significant shoaling and large amounts of fish are present around the shark. However their behavior was rather spontaneous; sometimes moving extremely fast at other times slower.

Table 1 - Shows the number of fish spotted on camera and notable observations when sharks were present including the time and date, in which the sharks were found.

Observations from table 1 show the correlation between schooling and the presence of sharks as well as the number of fish present during each encounter. Speed and other notable behaviors were also included.

Table 2: Average Number of Fish at Different Times of the Day When Sharks Are Not Present

Time of the Day	Avg Data from 9/1/2020	Avg Data from 8/31/2020	Avg Data from 8/29/2020	Total Average
Morning (9-12 am)	15.83	120.167	26.17	54.06

Noon (12-3 pm)	116	110.67	15.34	80.67
Afternoon (3-6 pm)	71	58.17	38.83	56
Night (6-11 pm)	295	66.17	66	142.39

Table 2 - Shows the average data regarding the number of fish that could be found at different times of the day. Data was collected throughout the course of 3 days and the total average was calculated.

Data from table 2 yields information about the number of fish that are expected throughout different times of the day. The data comes from samples collected over the course of three days (9/1/2020;8/31/2020;8/29;2020), and the average was calculated.

Table 3: Data Comparison

Incidence of Sharks	Number of Fish Found	Number of Fish that could be expected during similar times of the day when sharks are not present	Percent Increase/Decrease When Sharks are introduced	Total Avg Increase in Fish when Sharks are Introduced
Night 8:00 pm (8/29/2020)	200	142.39	40.46% increase	83% increase
Night 1:00 am (8/31/2020)	100	142.39	29.77% decrease	

Morning 5:30 am (9/1/2020)	170	54.06	214.465% increase	
Night 11:15 pm (9/1/2020)	300	142.39	110.689% increase	

Table 3 - Shows the comparison between the number of fish found when sharks were present vs when they were not present. The number of fish found during the incidence of sharks was then compared to the number of fish that could be expected to be found during similar times of the day when sharks were not present. Then the total avg increase of fish when sharks are introduced was calculated.

Table 1 was then compared to table 2 to find the percentage increase/decrease of fish when sharks are present. As emphasized earlier, I was careful to compare data from similar times of the day so that the factor of time would not impact the accuracy of the results. With that the total average increase/decrease of fish when sharks are introduced could be calculated.

Raw Data (Includes the Specific Data from Individual Days)

Table 1: Fish Data when Sharks Were Not Present (8/29/2020)

Time of the Day	30 Minute Interval	Average Fish in Different Times of the Day	Notable Behaviors					
Morning (9-12 am)	42 Fish	7 Fish	30 Fish	40 Fish	25 Fish	13 Fish	26.17	Did not observe any shoals in the morning. Mostly scattered fish.
Noon (12-3 pm)	10 Fish	8 Fish	17 Fish	16 Fish	17 Fish	24 Fish	15.34	Only a few fish that were mostly scattered were spotted at this time of the day.

Afternoon (3-6 pm)	90 Fish	45 Fish	30 Fish	3 Fish	60 Fish	5 Fish	38.83	Groups of small silver (streamlined fish around 5 - 10 cm swimming in a group in the same direction. Some discrepancies happened in the results as in one moment, only 3 fish were spotted. At another moment, there were only 5 fish as the water was really muddy.
Night (6-11 pm)	70 Fish	80 Fish	20 Fish	40 Fish	40 Fish 1 Sea Turtle	SHARK 150	66.00	Large groups of small silver (streamlined) fish around 5-10 cm swim in a group in the same direction. Moving very fast and appears as a group; and enters in and out of the screen constantly. Groups of other larger fish are scattered sparsely around the seafloor.

Table 1 - Shows the number of fish spotted on camera at different times of the day in 30 minute intervals as well as notable observations. The average number of fish at different times of the day were then recorded. This set of data was all recorded within the same day at (8/29/2020)

Table 2: Fish Data when Sharks were not Present (8/31/2020)

Time of the Day	30 Minute	30 Minute Interval	Average Fish at Different	Notable Behaviors				
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	Interval						Times of the Day	
Morning (9-12 am)	17	140	4	160	180	220	120.167	Sometimes there are shoals which result in a high number of fish. Other times fish are just randomly scattered around Sometimes the cameras were also oriented in different spots which results in a limited view and causes some discrepancies in the results.
Noon (12-3 pm)	190	20	160	120	24	150	110.67	I did not observe any additional notable behaviors.
Afternoon (3-6 pm)	60	40	70	9	120	50	58.17	I did not observe any additional notable behaviors.
Night (6-11pm)	100	70	80	130	8	9	66.17	Once again the cameras were oriented at weird spots at times making it difficult to spot fish.

Table 2 - Shows the number of fish spotted on camera at different times of the day in 30 minute intervals as well as notable observations. The average number of fish at different times of the day were then recorded. This set of data was all recorded within the same day at (8/31/2020)

Time of the Day	30 Minute Interval	Average Fish at Different Times of the Day	Notable Behaviors					
Morning (9-12 am)	15	14	7	7	50	2	15.83	Didn't notice many fish this morning. Mainly because the shoals that I'm used to observing are not present.
Noon (12-3 pm)	130	14	150	80	22	300	116	Whenever there are shoals there are a lot of fish.
Afternoon (3-6 pm)	120	100	33	3	80	90	71	Didn't notice any new additional behaviors.
Night (6-11 pm)	300	250	270	300	250	400	295	Huge numbers of fish were spotted. Mostly in shoals.

Table 3 - Shows the number of fish spotted on camera at different times of the day in 30 minute intervals as well as notable observations. The average number of fish at different times of the day were then recorded. This set of data was all recorded within the same day at (9/1/2020)

As evidence from the raw data, shoaling and other behaviors also occurred when sharks were not present.

Discussion

My hypothesis, which was that there would be fewer fish and less movement when sharks are present, was not supported. Although the black carp and snakehead experiment suggests a similar scenario in which the prey responded by maintaining a larger distance and reducing movement, this experiment suggests different behavior. As explained in the results, the number of fish increased on average 83% after sharks were introduced, and there was no

significant correlation between the amount of movement and shark presence, which disproves my hypothesis.

However, evidence from this research does provide new insight into some of the behaviors that fish use to respond to predators, which was the aim of this experiment. Evidence from this research suggests that there is a strong correlation between shoaling and shark presence, which is why there was also significantly more fish when sharks were around. Shoaling can be a useful strategy that provides groups of fish protection from its predators. Coordinated movements such as the ‘U-turn’, forming the ball, dividing in half, or the ‘explosion’, are sometimes used to deter predators.⁴ Although I believe the sample size of this research and some of the issues encountered does not provide enough concrete evidence to support this conclusion, it does provide a very interesting new insight into some of the unexpected interactions between predators and prey in the ocean.

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⁴ Watson, Gordon. “Why Do Fish Shoal.”

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Regulation: A Must For Vietnam Retail FX Market by Viet Giang Pham

Abstract

The retail FX market is certainly not a new field to Vietnamese, as reports of scams and documentaries of frauds have filled the news in recent years. Domestic investors have ambivalent attitudes towards this market, either associating it with deception and mistrust or enthralled by the enormous payoff this market boasts off. The government has largely neglected the retail market in its policy, concentrating exclusively on regulation of the multinational/interbank FX market. This wide legal gap has facilitated the conduct of numerous scams and frauds, which take the form of FX brokerage, luring investors in with bonuses and promises of easy profits. Most cases are only resolved by authorities after the schemes have been completed and fortunes have been siphoned off. Until then, innocent traders have lost their life savings, mortgage payments, or even their houses. Observing this alarming situation, I conduct this study to advocate for government regulation in the retail FX market to better protect investors. In order to do so, I have met with experts in the field to procure both practical and legal approaches to the market, as well as consulted several articles, academic papers, and reports on the nature and situation of the market in countries including Turkey, the USA, and Japan. Through my study, I conclude that regulation is vital to protecting investors in this market, either from engaging in scams or from hemorrhaging from margin trading. Regulation in this market has been implemented successfully by a myriad of developed countries, and the most basic points of their legislations are reported in this paper.

Intro

The goal of this paper is to explore whether regulation should be introduced in the retail FX market in Vietnam based on the numerous benefits regulation would bring to clients. I argue that regulation would improve the transparency and integrity of brokers and in turn guarantee better safety for investors. Through interviews with legal partners, articles references, and official reports, we are able to find insights on how regulation in other countries have been conducted and the positive results of the regulation in reducing the number of scams and frauds and in boosting trading confidence. We also manage to find evidence on how leverage should be controlled using both academic results and real-world cases.

In the first experiment, I inspected regulatory attempts from the US and Turkey and discovered the two countries underwent the same market problems of scams and frauds which necessitated the presence of authority. Although details may vary, regulations in the two countries try to tackle the issue by mandating the registration of FX brokers and setting up rigid requirements for brokerage.

In the second experiment, I make use of both academic and real-world evidence of Japan to prove that high leverage is extremely detrimental to ordinary investors. I manage to conclude that a limit on leverage can be beneficial to traders both on a small and large scale.

The results of these experiments do imply that regulation should be imposed in the retail FX market to protect investors. Not only can regulation fend off 'fake' brokers but it also ensures protection of investors by limiting the risk they are able to take.

Hypothesis

In this article, we strive to determine how the establishment of authority in the regulation of the retail, over-the-counter FX brokerage can be beneficial to traders.

One of the primary issues in the retail FX market in Vietnam is the establishment or presence of countless scams or 'fake' brokers. These 'fake' brokers, predominantly headed by Vietnamese people, usually locate their servers in a foreign country, especially Taiwan, Hong Kong, or Singapore, places where Vietnamese authorities cannot enforce legal actions, and these brokers' establishment is often not recognized in any legislation. The brokers, subsequent to their illicit introduction, will try to lure as many domestic investors into their platforms as possible through unfounded promises of enormous 'fast' profits. When enough investors are tricked and enough money dispossessed, the brokers will announce their so-called 'cease of operation' before absconding with millions of dollars of traders' money. In one notorious case, a 'fake' broker under the name of FX Trading Markets has successfully attracted more than 60,000 investors nationwide with promises of sky-high profits before suddenly disappearing and siphoning off at least \$50 million of investors' money. The broker indicated clear signs of a Ponzi scheme, a system where newcomers' investment will be used illegally to pay for the bonuses of the people before them. What is noteworthy is that until the time of this article, 1 year after the mysterious disappearance of the broker, nobody has been indicted and investors are still left in heavy loans and miserable plights. This is just one of the estimated 240 illegal trading floors of gold and

foreign currencies in the country in early 2021. Arises from this alarming situation is a strong need to prevent such a scheme from repeating itself in the form of a legal framework that protects investors from malevolent forex brokers.

Secondly, Vietnamese investors tend to fall prey to high leverages in hope of faster, higher profits. The WikiResearch survey reveals that the highest leverage that 70% of the brokers in Vietnam are providing to domestic traders is 500, and that more than three fourths of them believe leverage of 1000 will be even more effective in enticing investors. Being callow and mentally swayable, most of the domestic traders will eventually end up using the leverage unwisely and recklessly. To put this number into perspective, the maximum leverage that regulators from the US and the UK permit is 1:50, ten times lower than the favored leverage in Vietnam. With that being said, there should be a cap on how much leverage should be offered to Vietnamese traders by forex brokers, and that kind of protection against careless betting is one of many advantages that establishing a competent authority in Vietnam to regulate the brokerage operation can deliver.

Methodology

Interview

I have interviewed two foreign experts, one a legal partner and the other an author of a renowned FX website. The first respondent is Demetri Bezaintes, a Registered Foreign Lawyer (RFL) practicing law at Giambrone Law's office in the UK. He often deals with cryptocurrency, Forex trading disputes, and regulatory investigations in countries ranging from Vietnam, Belize, to Italy, England thanks to his in-depth knowledge of jurisdictions around the world. The second respondent is Arnab Shome, a writer on Finance Magnates, one of the most well-known informational websites in the field of FX trading and cryptocurrency. He has composed over 4700 articles for the website, covering a wide variety of topics from settlement cases to regulatory approaches.

Through the interview, I expect to elicit multiple perspectives on whether the OTC forex market should be and is worth being regulated, and if yes, in what way. The respondents have encountered several legal cases around the world, so what they can provide is an insight into how countries deal with this issue of both scams and investor protection. Additionally, they can voice

out their own viewpoints with regard to this market from their experience of working for multiple years in this field.

During the interview, 5 primary questions were asked:

1. Do you think it is necessary for governments to regulate the OTC forex market?
2. What do you think are the reasons why the FX market isn't legal in some countries, including Vietnam, yet?
3. If the government were to regulate FX brokerage, what would be the best possible course of actions to do so? If the government were not, what would the government do to reduce the rate of scams and related illegal activities?
4. Can you point out successful regulation cases around the world? How do governments in those countries deal with scams and protect domestic investors?
5. Do you think the OTC FX market should be suitable for ordinary citizens?

Through their responses, I can observe a coherent belief that the OTC FX market should always be regulated, but governments may vary in their regulations due to different approaches and different situations. Both of the two respondents believe that the OTC FX market is not suitable for the average person as 70% of traders, they point out, either lose or quit in the market in the long term. However, that should not deter regulatory efforts as governments need to protect domestic investors from scams, which are omnipresent in this market, and their own greed, particularly through limiting the maximum leverage.

Journal articles:

I primarily make use of three journal articles throughout this research paper. Here are the ones which contribute the most to my research and have provided invaluable information:

1. “Retail FX Trading in Turkey Gets Unusual Boost” by Joe Parkinson and Yeliz Candemir in the Wall Street Journal. The article explores the regulatory scene in Turkey, one of recent countries that take OTC FX trading into regulation, and reports the subsequent reactions of both traders and brokers involved in the market.
2. “Forex leverage: How it works, why it’s dangerous” by Dominic Chu on CNBC. The article refers to specific cases where leverage has proved to be detrimental to retail traders and suggests leverage be used wisely by investors.

3. “Sayonara Mrs Watanabe; Japanese retail investors quit the FX market” on EuroMoney. The article presents statistics, including daily trading volume and number of positions opened daily, to indicate the effects of a cap on leverage on traders and the market in general.

Report:

In conducting this research, I utilized a report by WikiResearch titled “Global Forex Margin Trading Market and User Research Report: Vietnam.” It provides me with information on the current retail FX market in Vietnam as well as the average Vietnamese FX traders. From there, I can compare the market and traders in Vietnam to that of other countries which have successfully established a regulatory framework in order to outline what steps the Vietnamese government should make towards the goal of regulation.

Experiment

To test my hypothesis on the effects of an authority’s presence on traders’ safety, we shall look at cases around the globe. In the U.S. alone from 2001 to 2007, approximately 26,000 individual traders have lost \$460 million in frauds relating to forex margin trading. Observing such an alarming situation, a special task force, formulated by the CFTC (Commodity Futures Trading Commission), has been established and has since introduced multiple rigid regulations to ensure the traders’ safety. One of the regulations that has been passed is to require all US brokers to have a minimum deposit of at least \$20 million. Such a standard has reduced the brokerage operation significantly, and those who remain are legitimate ones, including FXCM, CitiFX Pro, and Gain. Before that, the U.S. was the place to go for FX brokers who are scouting for regions with the least amount of regulations. Although empirical effects have not been determined nor specified, we see that in trying to curb illegal activities in this market, the first step would be the establishment of a competent authority. As Demetri Bezaintes, an associate at Giambrone Law, an award-winning, international full-service law firm, would like to point out in my interview with him, “there should always be a certain degree of regulation required,” and that “It’s not a free land, and we don’t allow just anybody to take people’s money.”

In another case of effective regulation, Turkey’s Capital Markets Board (CMB), the official financial regulatory body in the country, tightened the rules for FX brokerage starting from

September 2011. Brokers are obliged to register with the CMB and comply with several stringent new standards, one of which makes it compulsory for brokers to place their collateral in a settlement and custody bank, thus backing the market up with insurance. Prior to the advent of regulation, the retail FX sector in Turkey is best described as ‘chaotic.’ Before, brokers used to offer services under no oversight of any authority and basically were able to swindle investors’ money easily. The market was steeped in allegations of theft and scams, and consumers’ confidence was low. However, things started looking upward for both the traders and the domestic retail FX market since the introduction of rigid rules and requirements. In just over one year, clients’ faith dramatically rose, and daily trading volumes have been reported to triple to \$1 billion. Not only that, better regulation has rendered the so-called ‘big players,’ legitimate brokerage houses who have undergone certain auditing, eager to obtain market share in this fast growing market. These established brokers, undoubtedly, will be able to provide much better service and a safer trading environment overall to the domestic traders than the local ones.

On the second hypothesis, a cap on leverage plays a vital role in preventing sudden deaths for investors, as well as reducing the risk of catastrophic collateral damage. In an article published in *Journal of Money and Economy* in 2019, the two authors, Shahram Moeeni and Komeil Tayebi, suggest that leverage of 1:50 can result in 89.4% probability of loss, and leverage of 1:50 only has less than 2% of winning. On the other hand, however, they also found that leverage ranging from 1:10 to 1:50 rarely renders traders vulnerable to sudden insolvency. In a real-world case, the Financial Services Agency, the watchdog of Japan’s foreign exchange transactions, has long been imposing a cap of 1:25 on the maximum leverage that brokers can offer to domestic investors. The country, which boasted 800,000 active forex accounts in 2019, is one of the Forex hotspots around the globe, leading the Asian trading session with \$1 trillion in trading volume per day. Therefore, the need to protect these retail investors is one of primary concerns for the country’s authority, and the limit on leverage indicates the extent to which Japanese authority strives to protect domestic investors. Before the introduction of the cap, brokers used to offer leverage up to 1:400, which is in itself a recipe for disaster. Gradually, the FSA cut the maximum leverage to 1:50 in 2010 and finally to 1:25 in 2011. Furthermore, in order to ensure the efficiency of the leverage cap, the FSA has banned domestic investors from opening and trading with an offshore account since foreign brokers have often tried to entice Japanese traders with leverage of 1:100 or more.

Market-wise, a cap on leverage can avert the “trickle-down” effect that results from huge bettings that go wrong. For instance, with only low leverage permitted, a loss day will not necessarily turn into enormous losses for everyone, but if high leverage is allowed, then small losses’ impact can be magnified, causing a cataclysmic chain reaction. That was exactly the case when in January 2015, the Swiss National Bank (SNB) removed the peg of Swiss francs to euros. For three years, the exchange rate was kept stable at 1.20 Swiss francs per euro. After the abandonment of the cap, the franc soared over 40% against the euro. Such a jolt in the exchange price resulted in the insolvency of multiple brokers, the most noteworthy of which is the bankruptcy of Alpari (UK). What followed was huge losses borne by both brokers and traders and multiple leverage caps introduced by authorities worldwide, including the Japanese FSA.

Country	Regulatory body overseeing retail FX brokerage	Maximum leverage offered by brokers
Vietnam	None	1:500 or more
US	US Commodity Futures Trading Commission & National Futures Association	1:50
UK	Financial Conduct Authority	1:30
Japan	Financial Services Agency	1:25

Regulatory body and maximum leverage in different countries

If the government were to take these two above measures, investors would be benefited in two major ways. First, a report by WikiResearch indicates that the average FX margin investors in Vietnam are rarely aware of the regulatory situation surrounding the market. In most of the cases, so enthralled are the traders by the enormous payoff that brokers promise that they invest little time researching the legality of this market and the brokers before investing. If a competent authority is set up to control FX brokerage, this would help raise awareness of the investors of the frauds and scams that are omnipresent in this market as well as effectively limit,

or terminate if possible, the establishment and operation of ‘fake’ brokers through rigid requirements. Only registered brokers can operate and offer services in the country, and thus, traders would be aware that they are protected by regulations, which in turn boosts consumer confidence.

Second, a cap on leverage is vital to protecting investors from being too rapacious. Many amateurish traders opt for leverage as high as 1:100 or more, but as we have discovered, leverage higher than 1:50 often leads to sudden death for inexperienced investors. Thus, if the government were to introduce a limit on leverage, investors would enjoy a much better chance of surviving and profiting in the long term. Furthermore, a leverage cap might forestall the ‘trickle-down’ effect on a large scale, which is the result of a combination of wrong bettings and high leverages.

Limitation

In conducting this study, I was not able to find evidence from countries that better resemble Vietnam’s economic and social conditions than Turkey, Japan, and the USA. Although problems in this market are relatively similar in different countries, including scams and high leverages, if I were able to assess regulatory attempts from countries like Thailand or Laos, effects of regulation on the Vietnam retail FX market would be more certain to predict.

The research also lacks specific statistics on FX-related scam rate pre-regulation and post-regulation in other countries. If details like this can be included, it can further explain how regulation can help protect investors and offer empirical evidence on the results of regulation. For instance, a statistical set of the number of FX scams reported to authorities before and after the promulgation of regulation and requirement of brokerage authorization would provide empirical support to how operation of scams can be limited.

Given these limitations, the paper’s support would be stronger if I were to have access to more surveys and more statistical analysis on the situation of the retail FX market in countries similar to Vietnam.

Conclusion

In this paper, I argue that the Vietnamese government should regulate the retail FX market. I have conducted a study to find evidence on what benefits regulation would bring to traders in this market. Initially, my hypotheses are that regulation would limit the FX-related

scam rate, thus effectively defending investors from frauds and schemes, and a leverage limit, once imposed, would prevent and ultimately protect traders from huge betting and hemorrhaging. By interviewing legal partners and experts and referring to articles and reports, I manage to draw up pictures of pre-regulation and post-regulation in other countries and get insights into the basic actions and results of the regulation. Leverage, through my finding, proves to be detrimental to amateurish investors in most of the cases and should be strictly limited.

The first experiment is to investigate regulations in two countries, the US and Turkey, in order to conclude the situation in which regulatory intervention is necessitated. In both countries, high rates of scams and frauds proved to be a major concern for investors and authorities to the point that legal bodies were tasked with regulating this market. Basic regulations include registration of brokers, and positive results have been reported.

The second experiment is to determine whether a limit on leverage should be imposed as part of a regulatory attempt. By referring to academic findings and real-world evidence, I manage to conclude that leverage is not to be used by ordinary traders and a cap on leverage is indispensable to protecting investors on both small and large scales.

The results of these experiments align with what I have hypothesized, meaning that regulation is needed to ensure a safe trading environment for FX traders in Vietnam, and a leverage cap should be one of the basic legislations in the effort to do so.

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Major Factors of the Current Inflationary Pressure By Jiarui Li

Abstract

The annual inflation rate has reached its highest level in decades across the U.S., Europe, and many other countries in the post-COVID-19 era. In 2021, the U.S. has even hit its highest annual inflation rate of 8.6% since 1981. American economist Milton Friedman has a well-known quote on inflation in the 1960s. “Inflation is always and everywhere a monetary phenomenon, in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output,” (Milton Friedman). By definition, inflation is a monetary phenomenon as it refers to the process by which the purchasing power of money diminishes. While Friedman mainly attributes the inflation globally to prior increases in the money supply, this essay attempts to investigate that other than the increase in money supply, the change in the velocity of the circulation of money and the shortage on the supply side in the economy both play a significant role in the current inflationary pressure. The U.S. is used as an example in the essay as the U.S. has relatively comprehensive economic data and can most likely reflect the effect of COVID-19 on inflation in an efficient market. During the initial outbreak of COVID-19 in 2020, the change in the velocity of the circulation of money induced by COVID-19-related regulations, had a direct impact on the price level in the economy based on the Quantity Theory of Money, and eventually helped contribute to the historically high annual inflation rates in 2021. On the other hand, the shortage of supply, mostly resulting from the discontinued production across the global supply chain, posed further threats to the maintenance of a low and stable inflation rate.

The Increase in the Money Supply During the COVID-19 Outbreak

In response to the COVID-19 crisis, the Federal Reserve injected large amounts of liquidity into the market. The growing price level caused by a major increase in the money supply corresponds to Milton Friedman’s argument that inflation is produced by an increase in the money supply.

Shortly after the outbreak of the coronavirus pandemic, the Federal Reserve adopted a loose monetary policy to stimulate the economy. At its meetings on March 3 and March 15, 2020, the Fed cut its target for the federal funds rate by a total of 1.5 percentage points. The Fed also resumed purchasing massive amounts of Treasury securities and government-guaranteed mortgage-backed securities, releasing liquidity to the market, and encouraged banks to lend by

lowing the rate it charges banks for loans. The rapid growth in savings is reflected in a sharp increase in the M1 money supply, which promotes the willingness to pay for consumers and the willingness to invest for businesses. After the outbreak of coronavirus, the year-on-year growth rate of M2 in the U.S. has increased rapidly from 7% to 26%. Although the value of M2 is still lower than the growth rate of M0 in the same period, it is still the highest growth rate since the start of data collection in 1960, and double the growth rate in the 1970s. The inflationary pressure caused by the pandemic emergency procurement plan is relatively evident. In addition to the increase in the money supply, it is also worth noting that the velocity of money circulation and supply shortage contribute to the current inflationary pressure globally.

The Velocity of the Money Circulation Before and During the COVID-19 Outbreak

This essay applies the Quantity Theory of Money to analyze the role of the velocity of money circulation in the current inflationary environment. In monetary economics, the Quantity Theory of Money indicates the relationship between price level, money supply, the economic output, and the velocity of money circulation. The Theory is written as $MV = PY$, where M represents the money supply, V is the velocity of the circulation of money, that is, the average number of transactions that a unit of money performs within a specified interval of time, P is the price level, which is commonly measured by the CPI, and Y refers to the real gross domestic product. Based on the equation, any increase in M must increase P if V and Y are held constant (Henderson, 2021). In particular, the value of V is commonly derived from the other three variables in the equation.

According to the Quantity Theory of Money, an increase in the gross demand for goods and services attributed to the growing money supply should naturally induce a higher price level for an economy in the short run. Nevertheless, the decrease in velocity of the circulation of money during the COVID-19 outbreak in 2020 relieved the inflationary pressure in the short term to a certain extent as the monetary easing policies were initially adopted in many countries.

Historically, the velocity of money circulation in the U.S. fluctuated around 1.8 from 1960 to 1990, increased to 2.2 in the last decade of the 20th century, then decreased into a fluctuating downward trajectory and fell to 1.1 in the wake of the coronavirus pandemic. Before 2020, the increase in the money supply in the U.S., when quantitative easing was in effect, was partially

offset by a gradual decline in the velocity of money circulation, and the level of inflation has been mostly kept below 3%.

After the outbreak of COVID-19, governmental regulations including maintaining social distance and implementing curfews were widely adopted across the U.S. and Europe. The social regulations have decreased the level of consumer spending and investments, and correspondingly slowed down the velocity of money circulation. Consequently, the increases in the money supply should lead to an immediate increase in the price level, but the significant decrease in the velocity of the circulation of money again offsets the inflationary effect in the short run. The annual inflation rate of the U.S. measured by CPI data remained a low of 1.2% in 2020 across the U.S.

The Velocity of the Money Circulation and Supply Shortage in the Post-COVID-19 Era

Since early 2021, the velocity of money circulation has gradually recovered as consumers and some businesses began to adapt, whereas businesses that depended on the global supply chain were generally still negatively affected by the pandemic due to the lasting supply shortage of materials, manufacturing, and consumer goods. The combined factors of the growing velocity of money circulation and the continuous supply shortage altogether contribute to the soaring inflation.

When most governments no longer impose COVID restrictions, consumers tend to spend more money than during the pandemic. The spike in the savings rate across the U.S. and Western Europe as a result of stimulus payments and spending restrictions also left most households in a strong position to spend. A higher level of consumption pushed up the cost of goods on the demand side. On the supply side, however, the global supply chain has gone through serious challenges as factories worldwide discontinued production activities or produced fewer units of products, which lead to inefficiencies and higher costs for businesses, and the process of shifting to other suppliers is time-consuming and more costly in most cases. Companies have to pay more or wait longer for obtaining the equivalent materials, components, equipment, labor, etc before the pandemic. Monetary policies are fairly useless on the supply side, and the higher costs of businesses will eventually translate to higher prices of commodities, inducing a spiral effect.

Conclusion

In general, during the first wave of COVID-19, restrictions dampened the speed of money in circulation, which partially offset the inflationary effects of expansionary monetary policy in 2020. With the gradual relief of epidemic prevention and control, the U.S. economy continued to recover. The level of production and consumption consistently returned to pre-COVID levels, and the velocity of money circulation also moderately recovered. The Federal Reserve has not reduced the growth of the money supply to an appropriate level. Broad money M2 still maintains a double-digit growth rate. Eventually, the quantitative easing policies, when combined with multiple exogenous factors including the change in the velocity of money circulation and the shortage in global supply caused by COVID-19, and the Ukraine conflict adding pressure on prices of energy and food, led to astronomically high inflation rates in the U.S., European countries and many other countries.

To conclude, the argument of Friedman in the 1960s could still give us some insights into understanding the current inflationary pressures. Meanwhile, it is essential to point out that inflation can also be triggered by significant changes in the level of the velocity of money circulation. The era of the Coronavirus pandemic is an important example for economists, and remarkable changes in the velocity of the circulation of money may also occur during periods of wars and political or financial instability. Continuous monitoring and speculations on the velocity of money circulation, which can be interpreted by the level of economic and social activities, is crucial for monetary policymakers to assess both the short-term and long-term influence of potential monetary policies. Additionally, short of supply in the global spectrum triggered by COVID-19 is another factor that promotes the growth of inflation. Establishing a healthy and stable supply chain for core industries is of significance for any country to remain financially stable during a crisis. The optimization of the supply chain can be partly achieved in the long run by setting up multiple suppliers for key components both globally and domestically, and maintaining mutually beneficial relationships with major trade partners across the globe.

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Expansion of Democracy By Rohan Movva

From monarchy and conquest to democratic rule, self-determination, and peaceful coexistence, democracy has played an essential role in shaping the history of civilization. When democracy was first introduced in ancient Greece, there were far more enslaved people than citizens, making it difficult for anybody to take part. Democracy then mostly disappeared until it reappeared in the late 18th century as “representative democracy” (Capozzi). Since then, it has been widely accepted that human history in the contemporary age is moving toward greater democracy. Today, democracy is a cornerstone in American life. Not only does democracy promote American principles like religious freedom and labor rights, but it also helps to create a safer, more stable, and more wealthy global environment in which the United States may pursue its national interests (Capozzi). Democracy in America is the foundation that leads to capitalism, freedom, and individual growth. It is the foundation that every other country should build around to achieve the highest economic and social prosperity levels. Given examples like modern-day socialism in Vietnam or communism in China, to what extent are American-style democracy and capitalism a ticket to prosperity for nations fighting authoritarian rule?

While in the United States in 1831 studying prisons, Alexis de Tocqueville, a French sociologist and political theorist came back to France with an enormous amount of information on American society, which he compiled into his book, “Democracy in America,” a comprehensive examination of American society and politics. Two hundred years later, Tocqueville’s book is still a valuable tool for describing the United States to others and describing the United States to Americans. Equality was Tocqueville’s cherished political and social ideal, and he argued that the United States was the most advanced example of equality in action. He appreciated the individuality of the American people; he was wary of the dangers of an atomized and ironically uniform society, where “every citizen, being absorbed to all the others, gets lost in the mass” (Tocqueville).

Deborah Schildkraut, an American political scientist at Tufts University, said, “at a minimum American identity consists of two sets of norms. One involves an evolving set of beliefs that anyone can follow. These beliefs harken back to Thomas Jefferson and the ideals outlined in the Declaration of Independence. ‘We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable rights, that

among these are Life, Liberty, and the pursuit of Happiness.’ The other set of norms depends on attributes such as one’s race and religion” (Schildkraut). Tocqueville backs Schildkraut when he says, “I must say that I have often seen Americans make great and real sacrifices to the public welfare, and I have noticed a hundred instances in which they hardly ever failed to lend faithful support to one another” (Tocqueville). American identity is the patriotism that every American feels because every American can flourish from the free set of values that guide the nation. Opponents argue that individualism fosters a lack of care for society’s poorest members, resulting in increased economic disparity (The rise of authoritarian capitalism in the twenty-first century). Individualism, however, promotes personal success and independence, as well as the ability to determine one’s destiny.

As we see it now, the United States was not a society built on equality in 1831. The Indians were treated as though they were an alien race that needed to be exterminated. Slave owners saw their slaves as their property. Women were denied the right to vote and were subject to the authority of their husbands under the law. “A woman loses her freedom permanently in the shackles of marriage in America,” remarked Tocqueville (Tocqueville). Only free white adult men were considered equal in Tocqueville’s America. Only this group was entitled to full citizenship privileges. Tocqueville’s fascination with the United States was piqued by even this small degree of equality, which rendered the country drastically different from the rest of the globe. American democracy now is more inclusive than it has ever been. It wasn’t until the 19th Amendment in 1920 that women were granted the right to vote in all 50 states. The Voting Rights Act of 1965 was the first time that African-Americans in the South realized their right to vote under the Fifteenth Amendment. When Presidents were able to send young men and women under the age of twenty-one to fight and die throughout the world, they could do so even if those same young people could not vote in most elections prior to the 1970s. Therefore, American democracy is considerably better than it was 50, 100, or 200 years ago in almost every way possible. In many basic respects, democracy has triumphed in the twentieth century (Allion) as Americans have combated Nazism, totalitarianism, and communism, to name a few. American-style democracy seems stronger and more vibrant than ever at the turn of the century (Allison).

Today a worldwide pandemic ravages the world with disregard for democratic processes. Democracy is now in critical danger around the world, and it affects every person. Democracy

worldwide cannot be overrun; freedom and prosperity will be limited (Allison). In 2020, the number of nations heading toward authoritarianism outweighed those moving toward democracy (Banerjee). As a result of the pandemic, a five-year downtrend has been maintained, which has been unprecedented since the 1970s (Banerjee). A growing number of democratically elected administrations are resorting to authoritarian tactics, even in established democracies (Banerjee). In some of the world's most powerful countries, the backsliding has been particularly alarming (Brazil, India).

More democracy and freedom create a vicious loop of enhanced security, stronger economic development, and long-term relationships that benefit the United States (Capozzi). The foundations of international stability are laid by governments that are transparent, efficient, and democratic (Capozzi). It is imperative that America's official investments in fostering democracy and governance overseas be maintained. International democracy and governance projects have always had bipartisan support because of their advantages and strong representation of American principles dating back to the founding fathers (Norman). However, as a result of the Iraq War, this support has been weakened during the previous decade (Norman). People, rather than government, driven initiatives to support civil society and responsible government are highlighted by the recent democratic openings in the Middle East, Africa, and Southeast Asia (Banerjee).

The Eurasia Group Foundation has completed research on foreign public perceptions of the United States and its political system. Emerging market democracies have a negative view of the United States, but they believe that United States democracy protects the rule of law better than their own (Gel'man). While most people in authoritarian countries dislike U.S. foreign policy, the vast majority of them want more political freedom in their own nations (Gel'man). According to the results from these nations, "attraction" rather than "promotion" is the best strategy for promoting democracy throughout the globe (Gel'man). Politicians in the United States have been preoccupied with other nations' laws and structures, but not their political cultures. Voters would sacrifice short-term security and stability for the opportunity to exercise their democratic rights (Gel'man). The United States utilized military intervention to advance democratic ideals, but they haven't considered the issues this method causes (Allison). They've also disregarded the values and interests of the people they're trying to convince. Vietnam in 1954 was a prime example of this; there was a push by communist leaders to unify Vietnam

under one communist rule similar to that of the Soviet Union and China. The United States entered the Vietnam war, pushing for containment of communism and setting up South Vietnam modeled after American democracy, going against the self-determination of the Vietnamese people where Vietnam today still takes its roots back to North Vietnam as a one-party socialist republic (Rowe).

While there have been instances in which the United States has fallen short of the ideals of pure democracy, the idea that a government should be “elected by, and answerable to, the people” remains central to the country’s sense of self (Schildkraut). If a leader wants to keep a large number of people happy, he or she must act in a way that benefits the majority of people. If they don’t, they’ll be expelled or ousted. People in authoritarian regimes tend to assume leaders must keep just a tiny percentage of their constituents satisfied. As a result, they are less concerned about doing activities that are beneficial to the general population. Their actions benefit their friends at the expense of the wider public, which allows them to remain in power (The rise of authoritarian capitalism in the twenty-first century). Overall, The American Journal of Economics and Sociology, a peer-reviewed academic journal established in 1941, looked at the administrations of 133 nations from 1858 to 2010 and found that autocrats were either harmful or insignificant to their countries’ economies (Rowe).

Democracy and capitalism are often interwoven. While a democratic government assures responsible political institutions and an educated workforce with their fundamental rights, capitalism is seen as a method of providing the riches necessary to preserve political freedom (Norman). Both systems put the power in the hands of the individuals. It cannot be denied that a major driver of modern-day prosperity, innovation, and wealth creation is capitalism (Norman).

Competition and the accumulation of capital motivate companies to improve their efficiency, enabling investors to profit and consumers to benefit from lower prices on a wider range of goods and services (Norman).

On the contrary, socialists claim that concentrated wealth in the hands of rich capitalists results in a society with a few wealthy persons and a significant number of impoverished people, with the wealthy taking advantage of the less fortunate (Goldsmith). Greed is what socialists believe will lead to the destruction of the capitalist system. The capitalist believes that placing money in the hands of intelligent, successful, and hardworking people would push them to produce newer and better products and services because they will be financially rewarded

(Goldsmith). They adhere to the "trickle-down" idea of wealth rather than the "trickle-up" theory of poverty that they assert socialists believe in (Norman). Capitalism, despite its flaws, is the most effective economic system for decreasing the wealth gap and converting the impoverished into productive citizens in our country and across the world (Goldsmith). Excellence is rewarded under capitalism, but mediocrity is rewarded in socialism.

However, there are good reasons to be skeptical of democracy's long-term economic success. The Western democracies' share in the global economy has dwindled to less than a third in 2019 (Goldsmith). No longer is it evident that American-style liberal democracy has prevailed almost three decades after the conclusion of the Cold War. On an unprecedented scale, Xi Jinping has cemented China's political dominance. Vladimir Putin has become president of Russia for the longest period of time since Joseph Stalin. Populism is undermining even many democracies. As a whole, countries like Russia and China may be flourishing, but the people do not prosper or feel that same empowerment. According to the 2022 United Nations happiness metric, Russia, China, and Vietnam rank between 74 and 85 on the metric, whereas the United States ranks in the top 20 with 19 other democratic nations (The World Happiness Report). Furthermore, The Annual Review of Political Science, which is a peer-reviewed academic journal dating back to 1998, found that 95% of the Vietnamese population favors a free market economy, making Vietnam the most pro-capitalist nation in the world even though the current system is based on socialism (Norman). Individualism, which leads to individual prosperity, is far greater in democratic nations than in non-democratic nations leading countries like Vietnam to want an American-style system to increase individual prosperity.

Economic independence is a basic tenet of individualism in the free market (Goldsmith). Capitalist or classical liberal civilizations are characterized by economic freedom, enabling individuals to make their own economic decisions. democracy and individualism are inseparable, and any other political philosophy or civilization will never be able to include them (Potter). The individualist must think and act on his or her ideas and to pursue his or her happiness (Potter). Individuals are born with the right to freedom. Democracy is still the best way to ensure long-term stability and prosperity (Potter).

For people in many other countries facing autocratic rule, the question is, how can we achieve what America has? People in countries and territories like Venezuela, Algeria and Hong Kong hope to make strides to achieve an American esque democracy. Right now, they try their

hardest to achieve freedom and look at people like the Estonians as inspirations. Estonia is a small country near Russia that has worked to maintain independence against Russian influence for centuries. Against all odds, the Estonian people have come together time after time to defeat Russian and Soviet rule and influence their government and lives. To this day, they fight Russian influence but stay strong, happy, independent, and resilient with a strong democracy. Through this, they have come to an Estonian identity similar to American identity. Part of the Estonian identity is based on the Estonian song and dance festival, where tens of thousands of Estonians come together to celebrate their freedom. They see it as when so many people come to celebrate their freedom; nothing is impossible. “We cherish our freedom and our culture with the song and dance festival we’re singing ourselves free showing what we are” (The Song of Freedom at the Estonian Song & Dance Festival). They have created a unique identity that can be replicated.

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Replacing Gross Domestic Product as the World's Wellness Indicator by Isabella Yalif

Introduction

A common topic of discussion for economists is what to replace GDP with as the world's measure of welfare. A specific tool that measures output, GDP being used as a measure of welfare is far overstepping the intention of the measure. Government departments have proposed new methods, such as the UK's Office for National Statistics. Ed Diener exemplifies individual economists' work in the GDP replacement debate with his tripartite subjective well-being measure. Although, the majority of the new metrics, whether proposed by governments, organizations, or individuals, focus on just one aspect of GDP. May it be the economy, happiness, the environment, or another focus, many fail to take into account the larger picture. The aim of this paper is to propose a new measure that works to compile the strengths of many other replacement measures into one metric.

Discussion/Proposed new method

The new method proposed gives two numbers: an expanded version of GDP based on GPI assisted by imputations and the percentage of the expanded GDP that is beneficial to welfare, calculated through the GPI. The expanded version of GDP includes all 26 economic, environmental, and social indicators that GPI tracks, not just reported economic activity. It then adds all the different factors, not distinguishing between benefits and harms, just adding them all together; any missing data is filled in through imputations. The percentage is the percent of total expanded GDP that GPI deems to be beneficial economic, environmental, and social activity.

Why GDP is a bad indicator of welfare on its own

Today, GDP is used as the key measure of welfare and is referred to as though it represents overall progress. Governments, organizations, and economic analysts around the world use GDP as an indicator of welfare. Two examples of its countless global scale applications as a welfare statistics are that governments use changes in GDP as indicators of success in economic and fiscal policies and the World Bank and IMF use countries' GDP to determine which projects are funded around the world. GDP was designed to be a measure of output, not welfare: a measure of the volume of marketed economic activity, that is it. Thus,

when it is used to measure welfare, something far broader than what it was designed for, there are going to be many oversights and it will paint an incomplete picture of the social and environmental systems the economy operates within.

GDP ignores income inequality and the distribution of wealth. People benefit very unequally from GDP growth, yet growth is still accurately seen as a signal that everyone's welfare is improving by the same amount. There are links between income disparity and poorer overall health in a country, decreased worker productivity, increased social unrest, and increased crime. Further, when growth is concentrated in the wealthiest income brackets, it does less for improving overall welfare because the social benefits accrued from an increase in consumption by the higher-income are less beneficial than an increase by the lower-income. Even so, none of these inequality dynamics are shown when taking GDP growth as a sign of general welfare. Economic actions that are not formal transactions, but still influence welfare and impact the economy are also not reported in GDP. These actions include relief and charity, service of housewives, earnings from illegal pursuits, and many other actions that are integral to the economy.

A core omission from GDP is that it makes no distinction between costs or benefits. For example, certain kinds of defensive and remedial spending like health care, flood control, and crime prevention all increase GDP, but money that is spent is not to improve the standard of living but rather to protect or restore the quality of life that was there before whatever occurred. Meaning, this spending is doing nothing to increase welfare and should be seen as a cost rather than a benefit.

Finally, economic benefits of the environment are left out of GDP. More so, the metric encourages the depletion of natural resources faster than they can renew themselves. For example, because clear-cutting a forest for lumber is valued more in terms of GDP than the services a forest provides to an ecosystem if it remains uncut which are not included in GDP, then governments and organizations are incentivized to encourage clear-cutting over more sustainable practices for better apparent "welfare." This phenomenon goes beyond just environmental benefits and costs; GDP encourages many activities that counter long-term community well-being. Thus, GDP is not only not measuring welfare, it is lowering it.

What GPI is

General Progress Indicator (GPI) is a metric often used in place of GDP and was created in 1995. The indicator takes everything GDP uses into account and adds environmental and social activity that is assigned a dollar value. GPI then assigns every action to be negative (for harmful activity) or positive (for beneficial activity). In order to collect all of the negative and positive effects, the metric is tracked by 26 indicators split into three categories, economic, environmental, and social activity. GPI even weights personal consumption for income distribution in order to reflect the welfare implications of social inequity. The metric then nets the positive and negative results of economic, environmental, and social activity to examine whether or not it has benefited people overall. Thus, the metric will spit out a number that is either positive (economic, environmental, and social activity has been beneficial) or negative (activity has been harmful) that reveals by how much either the harmful or beneficial side outweighs the other.

How are and how should the non-economic indicators be measured when there is no data?

There is no available online data on how measuring non-economic indicators is done for GPI calculations when there is no clear data for a variable. Some traditionally irregularly reported variables are volunteer labor and illegal activities. Leaving out non-market transaction data just because it is missing cannot happen because it will create a biased picture of economic, environmental, and social activity, so it is necessary to come up with a solution for this.

The proposed solution uses multiple imputations to calculate unobtainable data. An imputation attributes a value to a production, income, or consumption even when there is no explicit economic transaction. Some imputations are even incorporated into GDP, most notably imputed rents. Multiple imputation is a type of imputation that comes up with multiple estimates and leads to unbiased parameter estimates and accurate standard errors. The proposed way of creating such imputations is a stochastic regression imputation. The method uses a regression to find the predicted target variable value based on other peoples' values of the target variable and some explanatory variables from both the other people and the target person. Then, the predicted value is added to a random component which adds some important variability. Thus, by matching up the target person's available information with others like them, a predicted value can be calculated based on the other people's target variable data that is then varied slightly at the end.

The stochastic regression imputation method can be used for multiple imputation because software can incorporate the random value into a model to run it. Through this process, the current supplemental data, if any, for the missing data will gain robustness and accuracy.

Why not just use GPI?

There are multiple reasons GPI is not just being proposed as the new welfare indicator. GPI does not show how much total economic, environmental, and social activity there is or how much of it is positive or negative. The percentage of total activity that is beneficial in the proposed method is far more useful than the positive or negative number that GPI gives which holds little significance without extra information. Not only does it do the same thing as seeing if the output is positive or negative (just see if the percentage is over 50%), it also tracks and measures differences in beneficial or harmful activity over time. The most GPI can track overtime is if it is positive or negative.

Why use a GDP based method?

While it is in no way an accurate representation of welfare, GDP was designed to be a specialized tool to measure reported economic activity. When used for its initial purpose, it is a great indicator to use in conjunction with other measures for a more composite view. Also, it takes a lot of time, effort, and collaboration to make a brand new measure of welfare. Iterating off of a current method is far more attainable and has a straightforward way of rearranging accounting protocols.

Why the proposed method is the best tool for calculating welfare

The proposed method is designed to capture every aspect of welfare relating to the economy, environment, and social capital through the detailed cost and benefits system and imputations to support any insufficient data. The tool is able to account for the actual welfare of people by weighing different activities or things and their resulting damages or benefits, whether great or small. Furthermore, it is the best all encompassing tool to take over GDP's role of calculating welfare because it addresses GDP concerns, allows for significant statistical analysis and calculations, and it is not incredibly new.

One of the concerns about GDP is that it ignores income inequality, so in contrast, the tool includes the welfare implications of social inequity. Two other concerns are that GDP does not include economic actions that are not formal transactions and that it generally ignores the social and environmental systems that the economy operates within. The robust 26 indicator GPI system accounts for all economic, environmental, and social activity beyond what is reported, and if there is not enough data on anything, imputations are used to accurately supplement. The final concern was that GDP does not distinguish between costs and benefits. Not only does the proposed method distinguish between costs and benefits, it provides the exact breakdown of costs and benefits.

The breadth of statistical analysis and general calculations that could be done from the tool is quite robust. First off, one could calculate the dollar amount of economic, environmental, and social activity that is positive or negative, or calculate the actual GPI. From there, the limitations are endless on the cross-country analysis, analysis over time, and a host of other modes of analysis.

The general familiarity with the proposed method will make the implementation far more feasible and smooth. GDP is the basis of the tool, which, as the current measure of welfare, will make the transition easy for people to grasp and for current calculators to be changed. GPI has also been used in some capacity around the world. Notably, Canada, the US, and Finland have used it in a limited capacity. Specifically, within the US, Maryland and Vermont have implemented a GPI as one of multiple measures of welfare and other states are moving towards use such as Utah and Hawaii.

Conclusion

GDP is misused as a measure of welfare, and transitioning to a new tool that builds off of it is necessary. The proposed method builds off of GPI and GDP to create a robust measure of welfare that allows for in depth statistical analysis, smooth implementation, and addresses the concerns with GDP.

Implementation

The main concern with GPI and measures based on it, is that the assigned costs and benefits are subjective, there is little scientific justification behind them and they can easily vary

between different implementations of GPI. Part of this concern can be mainly avoided if the proposed method uses one weighing system universally. Regulating it would allow for cross-country comparisons and minimize the variability associated with subjectivity. Thus, every country would be using one set of values, which, while not truly the case in real life, doing so allows for the necessary cross-cultural comparisons. A future version of the tool could look into creating a unified system for designing different weighing systems for different countries, but the feasibility of such a large and complicated transition straight from GDP is low.

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Adolescent Mental Health Benefits From Physical Activity by Matthew Haroun

COVID-19, a worldwide pandemic, increased depression and anxiety in adolescents due to a decline in daily physical activity (Kang et al., 2021). Experts performed a study where adolescents wore an accelerometer to measure the amount of physical activity they performed on a daily basis. The results evidently revealed a relationship between physical activity and mood state. Through physical activity, negative mood states decrease, such as tension, anger, and depression, while vigor and self-esteem increase. Increasing the intensity of physical activity magnifies these results (Kang et al., 2021). A healthy mood state benefits adolescents by increasing their ability to focus and concentrate which enhances academic performance, increases self-efficacy, decreases social anxiety, and promotes relationships within adolescence. These changes may allow adolescents to gain confidence to meet new people and form new relationships, further benefiting the maintenance of a positive mood state. This variety of mental effects from acute and chronic exercises positively contribute to adolescence mental well-being. Physical activity is often overlooked as a powerful method to overcome mental struggles. Individuals who suffer from depression and low self-efficacy should consider using physical activity as a form of therapy to address these problems.

A number of studies illustrate the positive correlation between exercise and cognitive functions, which is exemplified through adolescent academic performances. One particular study involved eighty-nine high school seniors that took a questionnaire reflecting on their exercise habits. The results reveal that students who were more physically active received higher grade point averages compared to those who were inactive (Field et al., 2001). These findings are most likely caused by increased levels of arousal because of exercise, which leads to improved attention capacity (Vanhelst et al., 2016), consciousness, and information processing which are all key components needed to succeed through academics (De Bruijn et al., 2020). Physical education (PE), a class that is incorporated through schools, aims to make these cognitive impacts on students' brains in order to help assist them through schooling. Six studies that examine elementary school students revealed that giving students a break from learning through physical activity helps students focus, reduces fidgeting, and promotes classroom behavior (Troost, 2007). These studies signify the importance of incorporating physical activity in schools as it will drastically benefit academic performance.

Individuals who participate in exercise experience positive psychosocial changes, which includes the way they think, behave, and socialize (Spruit et al., 2016). In a study examining the relationship between self-efficacy, social interaction, and physical activity, 92 children were monitored by an accelerometer to determine the amount of physical activity they participated in within a week. Participants were asked to take questionnaires which concluded that an increase in physical activity has a positive impact on self-efficacy and social influences, which encourages adolescents to make new friends (Strauss et al., 2001). A 2009 study provides evidence on the impact friends make on adolescents and their motivations to be physically active. Experts used videogame sessions, in which participants completed tasks alone or with peers, and a “computerized relative reinforcing value task to earn points exchangeable for physical and/or sedentary activities” to explore the relationship between peers and motivation (Salvy et al., 2009). Peer encouragement motivates adolescents to take action and participate in physical activity. Through positive physical activity experiences, adolescents obtain a high level of self-efficacy, which leads to strong sense of confidence and self-concept (Bandura, 1991). Improved levels of self-efficacy decreases social anxiety (Rudy et al., 2012), which promotes relationships with friends and family.

Healthy relationships with peers correlates with adolescent well-being, which can be magnified through physical activity (Ullrich-French et al., 2012). As seen in Richard Strauss’s study, adolescents who participate in physical activity have a higher sense of self-efficacy, which motivates adolescents to step out of their comfort zone and perform uncomfortable tasks, such as meeting new people and creating new friendships (Strauss et al., 2001). Friendships play an important role in stabilizing mental health throughout adolescence, as positive peer relationships establish a sense of belonging, reduces stress, solves personal issues, and increases happiness (Clearly et al., 2018). To evaluate this relationship, experts conducted a longitudinal study measuring the social interaction of adolescents from early youth to elementary years (Guralnick et al., 2007). Results suggest that positive childhood friendships teach children how to manage and control their emotions (Clearly et al., 2018) - a skill these children will use through their adolescence and into the future in order to achieve happiness (Sakyi et al., 2015). Overall, these findings suggest that through physical activity, adolescents are able to gain the courage to create new friendships, which corresponds to forming a healthy mental well-being.

Acute exercise leads to short-term positive mental effects experienced immediately after a single workout session, while long-term mental effects can be revealed through chronic physical activity. One study evaluating these acute effects studied 47 high-school students with questionnaires measuring mood immediately after acute physical activity. Results concluded that participants experienced a decrease in fatigue, anger, and depression within a few minutes following the completion of the activity (Felver et al., 2015). This illustrates that exercise can be used to help cope with temporary mood instability, as a short workout session can drastically improve one's mood. In addition to the acute effects, long-term effects from physical activity were seen in a cross-sectional study of 988 students. Participants engaged in consistent physical activity, such as sports, in order to encounter the long-term effects. Measurements were recorded through questionnaires which revealed that consistent exercise increases adolescent's self-esteem and self-concept (Rasmussen & Laumann, 2013). These effects are noted to be most successfully reached through consistent exercise. There are an abundance of short-term mental effects as well as long-term effects that can be reached through a steady amount of physical activity.

The American College of Sports Medicine's (ACSM) "gold standard" physical activity guidelines recommend individuals participate in 150 minutes of moderate to vigorous aerobic physical activity and two or more muscle strengthening sessions a week (Swain et al., 2014). To successfully achieve these goals, individuals are encouraged to take action by using the FITT principle. When participating in physical activity, the FITT principle addresses the frequency, intensity, time, and type of physical activity. For example, intensity can be altered by changing the number of repetitions in weight lifting, or adjusting the speed of cardio. A heart rate monitor can be used to help individuals reach a certain heart rate, which is dependent on intensity. When participating in muscle strengthening activities, gradually increasing the intensity of exercises helps prevent burnout and achieve wanted results (Kester, 2020). Frequency and time represent how often and long each workout session should be, and type refers to the specific physical activity selected such as weight lifting. Beginners are expected to set their own FITT guidelines to their wanted difficulty to help assist them through their journey.

Taking action using the FITT principle will allow adolescents to obtain the positive mental effects and notice significant physical changes to their bodies. In an experiment to magnify the correlation between physical appearance and self-efficacy, a "quasi-experimental pretest-posttest control group design" was used. This experiment included an independent

variable which was a strength training program, and a dependent variable which were questionnaires related to self-efficacy and self-concept. Once the adolescent female volunteers performed the tasks in the independent group, experts compared their results to the questionnaires. These results revealed that girls who were part of the strength training program encountered significant self-efficacy improvements and increased confidence due to noticing changes in their bodies (Holloway et al., 1998). The FITT principle will positively change adolescence appearances, leading to a boost of self-love, self-efficacy, and confidence (Kalfas & Taylor, 1994).

Adolescents who perform enough exercise will notice functionality improvements, resulting in an increase in self-concept (Liu et al., 2015). Individuals may hit roadblocks or waves of demotivation in their journey due to questioning their actions. Strength and cardiovascular improvements are guaranteed to take place when participating in weight lifting and cardio. When adolescents notice functional improvements, they become motivated to continue their journey in order to become even stronger (Stubblefield, 2017). In general, when individuals notice improvement from performing a specific task, they become motivated to continue striving for growth.

Acute and chronic physical activity positively benefits adolescents academically, psychosocially, and relationally. By considering the FITT principle and engaging in physical activity, adolescents will notice physiological changes and functional improvements which further motivate them to perform physical activity moving forward. These increased activity levels will lead to improvements of general well-being and quality of life. As COVID-19 decreased physical activity, leading to population mental health concerns over the past few years (Fallon, 2020; Faulkner et al., 2021), many therapeutic physical activity programs were established to promote adolescent mental health. According to experts and adolescents, exercise is viewed as an effective treatment for epidemic mental health issues (Calfas, & Taylor, 1994). Adolescents who struggle with depression, anxiety, or other forms of negative mental health issues should participate in any type of physical activity in order to achieve a healthy mental state.

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The Applicability of Liquid Biopsy in Triple-Negative Breast Cancer by Yuzhu Clara Cai

Abstract

Liquid biopsy has been gaining increased attention in recent years with its considerable potential in diagnostic, predictive, screening, and prognostic assays in general oncology. Triple-negative breast cancer (TNBC) is the subtype of breast cancer that presents no established target for treatment selection thus limited strategies for treatment. With its high metastatic potential, it has been identified to have a marked genetic instability and mutational burden. To date, traditional chemotherapy and immunotherapy have been used to attempt tumor control; however, TNBC still illustrates a high risk of death and shows a need for novel approaches that may be more effective. Liquid biopsy used at different time periods of TNBC treatment may help to identify unique features that allow for the application of strategies to provide a better outcome. The ability to achieve such over time is due to its ease of application with the ability to obtain information from a minimally invasive approach via blood draw. With the interest to learn more about this technology in the context of TNBC, the objective of this study is to analyze the status of liquid biopsy in TNBC patients through conducting a comprehensive review of current literature.

Keywords

Translational Medical Sciences; Breast Cancer; Triple-Negative Breast Cancer; Liquid Biopsy

Introduction

Breast cancer is a pathological condition that occurs in the breast tissue. As the number of breast cancer diagnoses substantially rises worldwide, the current and future role of oncologists in the professional care of cancer patients is progressively challenging. In fact, breast cancer has become the second leading cause of cancer deaths among women across the globe.

Triple-negative breast cancer (TNBC) is a subtype of breast cancer that lacks the fundamental receptors — estrogen, progesterone, and the overexpression of the human epidermal growth factor receptor 2 (HER2) gene. Such results indicate that TNBC does not respond to

traditional hormonal therapy medicines or the medicines that target the HER2 protein; the only effective therapeutic treatment for TNBC is chemotherapy. Correspondingly, TNBC is known for its aggressive and invasive nature, with low 5-year survival and a much higher recurrence rate compared to hormone- or HER2-positive breast cancers. TNBC represents about 15% of all invasive breast cancers, and it is proved to be more common in women younger than 40 years of age, those of African or Hispanic descent, and with the presence of BRCA1 mutation. In recent years, the use of liquid biopsy and the sampling and analysis of circulating tumor DNA (ctDNA) or tumor cell fragments from blood circulation, was successfully tested with clinical trials in non-small cell lung cancer detection and treatments. Such findings contribute to a greater rate of early diagnosis and play a notable role in early detection and cancer treatment. It also aids the development of individualized therapy and the prediction of cancer prognosis. Several biomarkers are obtained in previous findings such as exosomes, tumor-associated antigens (TAAs), and tumor-associated autoantibodies (TAAbs); among others, the most studied and used one being ctDNA. Although all biomarkers are still the subject of ongoing research, understanding their role in cancer behavior and the process of carcinogenesis is crucial to further develop efficient diagnostic and screening tools.

Through discussing published literature in the relevant landscape, this review summarizes the latest findings on the clinical application of ctDNA-based liquid biopsy technology in triple-negative breast cancer, including its ultimate efficacy, early diagnosis, personalized treatment, prognosis prediction, and the future research progress of oncology technology.

Discussion

Understanding Triple-Negative Breast Cancer and the Triple-Negative Paradox

Triple-negative breast cancer (TNBC) is a heterogeneous disease that is estrogen receptor (ER) negative, progesterone receptor (PR) negative, and human epidermal growth factor receptor 2 (HER2) negative (Figure 1), based on immunohistochemistry. TNBC only affects 10-20% of the overall breast cancer-positive population and 13 in 100,000 women each year.

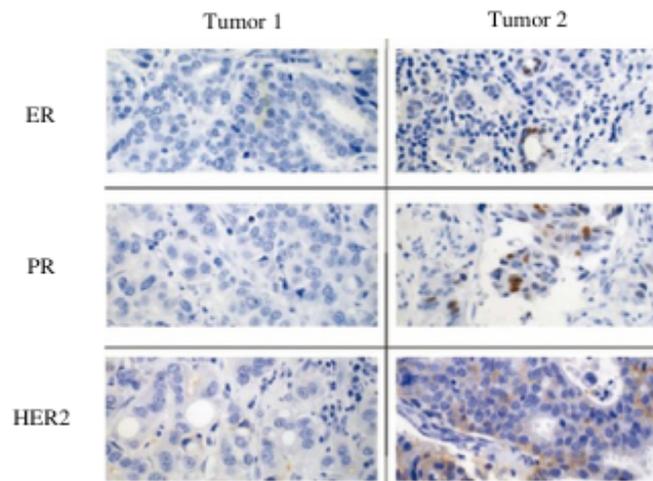


Figure 1. Tumor 1 is a triple-negative tumor (ER, PR, and HER2 negative) whereas Tumor 2 is ER, PR, and HER2 positive. The image is an example of stained breast cancer tissue; the brown color indicates the presence of ER, PR, and HER2 receptors, which indicates the microscopic absence of the 3 key targeting receptors in TNBC.

For now, established drugs such as trastuzumab or tamoxifen which specifically apply to ER-, PR-, or HER2-positive breast cancer seem unforeseeable in the clinical treatment of TNBC. TNBC is characterized by its typical ductal histology, high grade, high proliferation, and mitotic rates. It is associated with poor prognosis, a high risk of local recurrence, and poor disease-free and cancer-specific survival. In fact, a previous study of 906 early-stage breast cancer patients demonstrated that the TNBC subtype and the increasing number of cancer-positive lymph nodes are largely correlated with a superior local recurrence, further indicating the high malignancy of the disease. Other studies have also proven the risk for recurrence in TNBC patients is significantly higher in the first 3 to 5 years after diagnosis than in patients with PR- and ER-positive breast cancers. Another key contributing factor to TNBC's malignancy is that it is not amenable to current targeted therapies. Lack of estrogen, progesterone receptor, and the overexpression of HER2 excludes tailored therapeutic approaches with endocrine and HER2 targeted therapies. With the absence of targets, the mainstay of treatment has been with the use of cytotoxic chemotherapy and more recently the incorporation of immune checkpoint inhibitors. It has also been understood that in triple-negative tumors, there is a clear benefit of introducing these agents at diagnosis prior to surgery (neoadjuvant/preoperative chemotherapy) due to the

high risk early on of metastases and the aim of this treatment is to control local disease by reducing local and distant recurrence.

The “paradox of TNBC” is that early on the disease is extremely chemotherapy responsive in general but the effects can be short-lived as there are many patients who do enjoy the reduction of disease but those who do not achieve complete remission of cancer (referred to as a pathologic complete remission or pCR) at the time of surgical resection after this treatment, experience high rates of recurrence and death. This paradox of TNBC is also used because the more additional exposure to patients with TNBC after the initial administration of cytotoxic chemotherapy, there is an observation of relative resistance to chemotherapy in spite of initial responsiveness. Additionally, patients with metastatic TNBC rather than non-TNBC typically have poorer survival. The CALGB 9342 study concluded that overall survival was significantly shorter in those with TNBC compared with those with other subtypes, despite a similar rate of objective response and times to treatment failure. Furthermore, studies focusing on patients with metastatic TNBC concluded a more rapid progression during multiple rounds of chemotherapy, which is another consolidative evidence of its high relapse rates and low survival.

TNBC’s extreme malignancy, poor prognosis, and high recurrence rate further highlight an urgent need for more effective treatment options and more focused diagnostic tools that can assist early detection of the disease.

Circulating Tumor DNA as an Analyte in General Cancer Detections

Circulating tumor DNA (ctDNA) derived from tumors or cancer cells is present in the cancer patients’ plasma. Essentially, ctDNA is the extracellular DNA molecule (double-stranded and mitochondrial DNA) that came from cells found in the patients’ body fluids. The majority of available studies on the use of ctDNA deal with genetic analysis and mutation detection. The analysis of ctDNA (Figure 2) is often discussed in the context of the non-invasive approach to mutation detection that leads to mechanism resistance and therapeutic management in patients. With the development of highly sensitive methods and the ability to interrogate a large quantity of genes, substantial advancements have been made in this area of cancer detection. Interestingly, such a method is also used to analyze different features of the sample’s DNA, such as methylation status, size fragment patterns, transcriptomics, and viral load, which opens new paths for analyzing samples of liquid biopsy from cancer patients.

Past clinical investigations of ctDNA-based liquid biopsy present major success in non–small cell lung cancer, where examination and diagnosis of peripheral blood with tumor antigens are routinely used in clinical examinations. In the TRACERx study, results showed that ctDNA could be detected up to 6–12 months prior to a lung cancer diagnosis with imaging, because cancer-related chemical abnormalities and genetic mutation precede the appearance of detectable abnormalities, such as visible masses, in chest imaging. This significantly reduces or even possibly eliminates the risk of exposure to radiation by multiple follow-up imaging for stable lung lesions and reduces high false-positive rates and overdiagnosis seen in imaging screening. As a result, with previous evidence of success, liquid biopsy is emerging as a promising method for disease progression identification for cancer after adjuvant treatments or surgery, as well as the longitudinal monitoring for therapy response and disease progression.

Circulating Tumor DNA in Triple-Negative Breast Cancer Sample: Predictor of Prognosis

In previous findings of retrospective studies, ctDNA has an excellent ability to predict relapse and prognosis in TNBC patients who have completed their primary treatment. With sufficient supporting data, further stratification of TNBC prognosis can be achieved by incorporating ctDNA detection through liquid biopsy after the delivery of curative treatment. The ongoing phase II trial, cTRAK TN (NCT03145961), aims to investigate whether ctDNA screening can be used to detect cancer residue following patients' primary TNBC treatment. Dr. Nicholas C. Turner and his colleagues called this study “the first study to assess whether ctDNA assays can guide therapy for patients with early-stage TNBC”. Patients undergo double-blinded ctDNA screening every 3 months after the completion of primary treatment for TNBC. The trial's recent data found that using ctDNA early often assists the process of determining relapse of TNBC. This finding, if confirmed, would have significant implications for future study designs and allow for earlier intervention for cancer control which could impact tumor management and survival. It has also been observed that using liquid biopsy to identify mutations earlier in the patient experience may afford an opportunity to identify the development of variants and with more frequent monitoring, changes like these and other changes may be helpful for treatment approaches. Though this technology appears to be helpful in many patients, there have been findings that show it is not always helpful in some patients at risk for relapse. With this limitation acknowledged, this detection method, because of its ease in utilization, has the potential to be an invaluable tool in many cancers including TNBC. Ongoing studies and

measures to finetune this technology to provide clinically meaningful application will hopefully be forthcoming.

Comparing Tissue Biopsy and Liquid Biopsy: The Effects of Liquid Biopsy on Triple-Negative Breast Cancer

General biopsy is a fundamental tool for clinical assessment of cancer, aiding diagnosis and disease management. In an oncology setting, tissue biopsy is traditionally used for identifying and classifying diseases and profiling genetic mutations of cancer. However, such a historical method presents many restraints such as the concerns over single-biopsy (Figure 3). Previous findings demonstrate a significant intertumoral and intratumoral heterogeneity between primary tumor sites and metastasis sites. Consequently, a traditional surgical biopsy is proven to be not feasible due to its underestimation of tumor complexity and failure to see an overall picture of the disease. These limitations highlighted the need for a minimally-invasive, more modern approach to the real-time monitoring of TNBC. Unlike traditional biopsy, which usually involves either a surgical approach or a minimally-invasive procedure to collect tumor tissue, liquid biopsy can easily be done from a simple blood draw of the patient's plasma. Briefly, mutation detection in ctDNA-based liquid biopsy is mainly used for the purpose of:

- Diagnosing cancers prior to traditional detection such as radiology
- Customizing cancer treatment through genotyping
- Identifying mechanisms of resistance occurred in therapies to aid a better understanding of the disease
- Measuring and monitoring residual disease after treatment
- Inspecting cancer resistance or relapse to the already-administered treatments

Although tissue biopsy can sometimes be more affirmative, liquid biopsy is performed on a basis of easy access, allowing easier and more cost-efficient use, particularly among those who cannot have surgery. The use of liquid biopsy can decrease the time to treatment based on tumor detection, improve staff and resource efficiency, and can be used to test other diseases with greater scope. Moreover, it avoids postoperative complications of standard tissue biopsy, including the risk of more cancer spread, injury to surrounding tissues, and severe bleeding from the incision. In cases of tumors that show regional differences, liquid biopsy is able to test tumor

DNA fragments from different sites of the tumor and thus supply a more thorough genomic picture. With that being said, oncologists can more flexibly use molecularly-targeted

therapies, especially in cases of TNBC where targeted therapies are difficult to plan and execute. Likewise, liquid biopsy may bring a faster and more innovative method to select future TNBC clinical trial candidates and monitor response to the tested drug or agent.

Potential Challenges of the Clinical Adoption of Liquid Biopsy

Although a growing number of liquid biopsy is being performed, they still must reach two crucial goals before full adoption: its full clinical validation and the development of standards/regulations for their future adoption. In addition, a few areas include:

- In order to receive appropriate treatment decisions, strengthened clinical data must be established to create clinically beneficial outcomes
- Requires a deeper understanding of aspects of biomarkers and cancer biology, otherwise, risks for false results of liquid biopsy are possible
- The liquid biopsy tests that already received regulatory approval are low compared to those developed by various companies
- Before liquid biopsy can become an integrated part of regular oncologic practices, physician education must be ensured. Their sophisticated understanding of the utility and limitations of liquid biopsy enables the correct and most effective implementation of the technology for each patient

Estimates for Application

Research reports estimated a \$6 billion market value and \$26 billion market size for liquid biopsy by 2030. Currently, it has been utilized for diagnosing mainly lung cancer and screening for other types of cancer. It is often applied in clinical settings as a companion diagnostic for cancer detection which confirms the accuracy of performed tests.

Generally, as a breast cancer detection tool, many believe liquid biopsy can improve the diagnostic outcome, and evidence agrees that the more practical use of liquid biopsy technique is for high-risk patients who have a history of cancer or detected genetic mutation. Currently, liquid biopsy is commonly applied as a complementary technique to tissue biopsy; traditional tissue biopsy is still the main tool used for breast cancer and TNBC diagnosis, but for those patients who are unable to undergo or whose tumors do not allow an invasive biopsy, liquid biopsy holds great promise. And hopefully, with more established research, liquid biopsy can gradually be adopted in not only triple-negative breast cancer detection but also for all types of cancer.

The Future of Liquid Biopsy

In 2020, the United States Food and Drug Administration (FDA) approved Foundation Medicine's companion diagnostic test "FoundationOne® Liquid CDx", which can detect changes in all solid tumor masses with the initial diagnosis. This sequencing test can analyze more than 300 genes and their signatures which will be utilized to guide treatment selection and possible clinical trials for patients. Data from prospective studies have shown that liquid biopsy can even deliver advantages to patients beyond being a non-invasive approach, such as escalating quality-adjusted life years. As numerous companies have already taken action, it is closer and closer to making the widespread adoption of liquid biopsy a reality.

Conclusion

Despite an inability to perform clinical experiments to add original knowledge to the field of triple-negative breast cancer, through the format of a literature review, this paper made valuable derivations in the areas of summarizing previous studies and predicting the future role of liquid biopsy. Previous studies and research examined in this review have shown a high potential for the successful application of liquid biopsy in TNBC. However, its large-scale adoption will require further clinical evidence of clear and direct benefits for patients in order to complete full application and transition in hospitals, research institutions, clinics, private practices, etc. Ultimately, the future of liquid biopsy is believed to have the potential to increase diagnostic options and individualized care for breast cancer. Therefore, with further research and investigations, liquid biopsy marks a promising future in oncology and medicine.

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The Art of Losing Wars: An inquiry into how the US lost every war since WW2 By Matthew Pan

Ever since Sun Tzu published his military treatise *The Art of War* in the 5th century BC, countless generals and leaders have drawn inspiration from it in an effort to perfect the evasive art of winning wars. Nearly 25 centuries after its publication, the United States have shown that they had perfected the contrary – the art of losing wars.

The post-WW2 United States boasted the most technologically advanced and powerful army in the world. While the results of their military engagements during this period are difficult to assess and are often subject to fierce debates, it is undeniable that all of them failed to achieve their political goals. This was necessitated by ignorance of the rapidly changing nature of warfare, wishful illusions and assumptions, and a sickly obsession with winning in the traditional sense.

Before delving into the specifics of this peculiar art, one has to understand the evolution of the United States military. The importance of the United States military stretched all the way back to the age of American Imperialism (mid-19th century ~ World War I).^[1] Spurred by the ideology of Manifest Destiny, the United States sought to acquire the entire landmass between the Atlantic and Pacific Ocean either through migration, settlements, purchases, or ultimately, warfare. This was realized in the Mexican-American War (1846)^[2] in which Winfield Scott infamously laid siege to Veracruz and captured Mexico City. The subsequent Treaty of Guadalupe Hidalgo resulted in the United States gaining parts of present-day Arizona, California, New Mexico, Texas, Colorado, Nevada, and Utah. Having tasted the sweet cusp of victory, the United States initiated its next stage of expansion through a series of internal Indian Wars. While George Custer's "Last Stand" in the Battle of Little Bighorn (1876)^[3] came to symbolize the relentless military struggles in this era, it overshadowed the equally intense Black Hills War (1876), Nez Perce War (1877), and Messiah War (1890). By the 1890s, the United States military had morphed from a loosely coordinated institution into a seasoned war machine. The Marine Corps had emerged as an indomitable faction in the army, contributing to the United States' swift victory in the Spanish-American War (1898),^[4] Philippine-American War (1899),^[5] and Boxer Rebellion (1899-1901).^[6] After shocking the international community with these victories, the United States preceded to occupy Nicaragua (1912), invade Haiti (1915), and

launch the punitive Pancho Villa Expedition (1916).^[7] By the dawn of World War I, the United States military had become an internationally-recognized force to be reckoned with.

Thirty years later, the United States fully established its hegemony in what was the bloodiest war in mankind's history. By turning the tides of the war in favor of the Allies and obliterating the final strand of German dominance in Europe, the United States, along with the USSR, emerged as the world's new superpower. The resources and manpower Europe had so vaunted in the past centuries had been depleted, and it seemed to everyone that the United States, with the most technologically advanced and powerful army in the world, would become invincible.

History tells us not so. Since World War II, the United States military engaged in five major conflicts: the Korean War (1950-1953)^[8], Vietnam War (1955-1975)^[9], Persian Gulf War (1990-1991)^[10], Iraq War (2003-2011)^[11], and the Afghanistan War (2001-2021)^[12]. In all five of these conflicts, the United States repeatedly failed to achieve meaningful victories. Instead of reviving national pride as in the Spanish American War, the United States military was condemned both nationally and internationally for its ineptitude to win against weaker counterparts. Within a few decades, the United States has perfected the art of losing wars.

The famous war theorist Carl von Clausewitz wrote, "War is the continuation of politics by other means."^[13] This means that war is not about killing one's opponents – it is about achieving political goals. A Pyrrhic victory, named after King Pyrrhus of Epirus whose costly battles crippled his military exploits, is nonetheless a defeat in the long run.

Take the Persian Gulf War for example. When Iraq invaded the oil-rich Kuwait, the United States was resolved to remove Iraqi presence from the region. Under General Norman Schwarzkopf, the United States army along with a coalition of 35 countries liberated Kuwait and reached a ceasefire with Iraq leader Saddam Hussein. Widely regarded as a coalition victory, the United States became over-confident. This hubris blinded the United States from recognizing the simmering conflict in the troubled region as well as the growing ambitions of Saddam Hussein, who aroused support from many sectors in the Arab world. The Iraq War erupted in 2003.

From hindsight, one can see how the United States conflated *military* goals with *political* goals. In the Persian Gulf War, the United States addressed its military goals by launching Operation Desert Storm which ousted the Iraqis from Kuwait. They were able to do so through sheer manpower, brilliant leadership, and broad international support – all privileges one can

expect from a world superpower. Yet by focusing on its *military* goals, the United States ignored its true *political* goals – attaining perpetual peace in the region and toppling the regime of Saddam Hussein. The Pyrrhic victories the United States achieved during the war – three of the largest tank battles in American military history – amounted to nothing with the eruption of the Iraq War a decade later.

The same applies to the other major wars: in the Korean War, the United States failed to maintain peace between the two Koreas which tension persists to this present day; in the Vietnam War, the United States wasted twenty years without any military or political results; in the Iraq War, the United States created a power vacuum which gave rise to the Islamic State in Iraq and the Levant (ISIL); in the Afghanistan War, the United States withdrew to allow an immediate Taliban takeover.

“Meaningful victories” does not necessarily imply the attainment of military goals, but definitely the attainment of political goals. And the United States failed to attain such victories since World War II.

There are three main factors which allowed the United States to perfect the art of losing wars. The first one is *ignorance towards the rapidly changing nature of warfare*.

Prior to 1945, nearly all of the wars the United States fought in were against other countries. These include Mexico, Spain, and the Central and Axis Powers. There were identifiable banners, conspicuous uniforms, orderly reconnaissance operations, and systematic formations.

With the collapse of traditional powers in the two World Wars, however, fighting ensued amongst factions in individual states. These fighting are complex insurgencies where rebel groups often change allegiance in order to legitimize their grasp on the government.

This rendered the pre-1945 method of waging wars obsolete. Instead of merely launching technologically-advanced warships and fighters against clear enemies, the United States military had to consider the complex tensions amongst its enemies and the psychological impacts this would have on its own troops. War was no longer determined by a nation’s strength, but by its knowledge of the enemy’s culture and capacity to abandon traditional modes of thinking. Yet the United States experience in war “*did not prepare it well for counterinsurgency, where the emphasis is on light infantry formations, not heavy divisions; on firepower restraint, not its*

widespread application; on the resolution of political and social problems within the nations targeted by insurgents, not closing with and destroying the insurgent's field forces."^[14]

The United States ended up intervening in countries it had little cultural and historical understanding of. According to an Iraq Study Group in 2007, only 33 out of the 1000 officials in the United States embassy at Baghdad spoke Arabic. Only 6 out of those 33 spoke fluently.^[15] The military's ignorance spanned from, in the words of Professor Ahmed Hashim, "*societal networks, relations between tribes and within tribes, kinship ties*" to "*what is it people are fighting for?*"^[16] These types of ignorance created the conditions for insurgencies the United States face.

In Afghanistan, the United States military perceived the population as "*a rural tribal society bound by ancient customs and traditions.*" Afghans are not viewed as "*rational actors pursuing clear political interests shaped by history, but rather creatures of their culture and tradition.*"^[17] As in Iraq, there were few officials with linguistic competence in the two official languages of Afghanistan. Due to its geopolitical miscalculations, the United States military relied on Pakistan – a country that did not share America's stance towards Taliban – to allow the passage of its troops and supplies.^[18] The United States' inability to understand the complex relationships between the Taliban, Afghans, and neighboring countries shattered any chances of reaching permanent solutions.

The transition from interstate wars into intrastate wars^[19] also highlighted the importance of guerrilla warfare. The hit-and-run tactics adopted in guerrilla warfare often baffled American troops who were trained to fight in trenches or battlefields, not jungles or populated areas.^[20] Prior to 1945, the United States could destroy their enemies by pinpointing them with its superior technologies. Yet in conflicts where the enemies hide in the population, these technologies become irrelevant.

Guerrilla fighters are able to inflict damage without being seen for days, much less being killed, and this often led to growing frustration amongst their enemies who would often lash back in blind fury. In the Vietnam War, Lieutenant William Calley and his troops faced the same problems. They responded by razing a Vietnamese village in what was known as the My Lai Massacre (1968).^[21]

In response to the My Lai Massacre, the United States had officers take courses in ethics. While this was a necessary action to prevent future war crimes, it also revealed the weakness of

the United States regarding guerrilla warfare. Since one can never identify his enemies in a guerrilla war, the only way to win is to slaughter everyone in sight. The United States rightfully rejected such means, but in doing so rejected any possibilities of winning any guerilla wars. General Norman Schwarzkopf confirmed this in a September 1990 interview, “*If someone said, ‘Go in and machine-gun a thousand civilians,’ I’d say, ‘Absolutely not!’ Sorry, but I consider that illegal and immoral and I’m not going to do it.*”^[22] With no other alternatives to killing everyone, the United States were defeated in guerrilla wars in Korea, Vietnam, Iraq, and Afghanistan.

The United States had become so powerful after World War II, especially after the USSR collapsed, that it was tempted to apply the same mentality and tactics in distant conflicts. It repeatedly put itself in precarious situations by invading nations which it had little cultural and military understanding of. It did not think of any alternatives to waging a guerrilla war. The results were widespread resentment, declining morale, and a legacy of failure. The reason the United States eagerly rushed into distant conflicts without adequate knowledge was *wishful illusions and assumptions*.

The key to these illusions and assumptions is a blind optimism towards nation-building. Prior to 1945, diplomatic and military policies in the United States were mostly aimed at securing the stability of the United States itself. The policies in the American Imperialist Era sought to bolster the United States’ status in the Americas, as evident in the Mexican-American War and Spanish-American War. The policies between the two World Wars promoted isolationism amidst the global Great Depression as the United States gradually rebuilt its economy and infrastructures.^[23] Save for some interventions in South America and China, the United States was reluctant to become involved in European alliances and wars.

These inward-looking policies were reversed after World War II. With the demise of traditional European powers and a new threat in the USSR, the United States, for the first time in its history, assumed the role of global policeman. In addition to deterring Soviet expansion in the Cold War (1945-1991), the United States claimed the responsibility of restoring democracy and freedom to those shattered countries in the world. From then on, wars were fought with the knowledge of a potential nation-building mission in the future. Yet the United States had absolutely no experiences in nation-building.

In a 2003 policy brief titled “Lessons from the Past: The American Record on Nation Building”,^[24] the think tank Carnegie Endowment for International Peace identified 16 attempts at nation building through the establishment of democratic institutions desired by American policy-makers. The results were striking.

Table 1. United States-led Nation-Building Efforts since 1900

TARGET COUNTRY	POPULATION	PERIOD	DURATION (YEARS)	MULTILATERAL OR UNILATERAL?	TYPE OF INTERIM ADMINISTRATION	DEMOCRACY AFTER 10 YEARS?
Afghanistan	26.8 million	2001–present	2+	Multilateral	U.N. administration	?
Haiti	7.0 million	1994–1996	2	Multilateral	Local administration	No
Panama	2.3 million	1989	< 1	Unilateral	Local administration	Yes
Grenada	92,000	1983	< 1	Unilateral	Local administration	Yes
Cambodia	7 million	1970–1973	3	Unilateral	U.S. surrogate regime	No
South Vietnam	19 million	1964–1973	9	Unilateral	U.S. surrogate regime	No
Dominican Republic	3.8 million	1965–1966	1	Unilateral	U.S. surrogate regime	No
Japan	72 million	1945–1952	7	Multi-unilateral ^a	U.S. direct administration	Yes
West Germany	46 million	1945–1949	4	Multilateral	Multilateral administration	Yes
Dominican Republic	895,000	1916–1924	8	Unilateral	U.S. direct administration	No
Cuba	2.8 million	1917–1922	5	Unilateral	U.S. surrogate regime	No
Haiti	2 million	1915–1934	19	Unilateral	U.S. surrogate regime	No
Nicaragua	620,000	1909–1933	18	Unilateral	U.S. surrogate regime	No
Cuba	2 million	1906–1909	3	Unilateral	U.S. direct administration	No
Panama	450,000	1903–1936	33	Unilateral	U.S. surrogate regime	No
Cuba	1.6 million	1898–1902	3	Unilateral	U.S. direct administration	No

^a The United States won World War II as part of the Allied victory over Japan, but the United States assumed exclusive occupation authority in Japan after the war.
Sources: Data compiled by authors.

With the exceptions of Japan and West Germany, both ambiguous successes themselves, and Grenada and Panama, both nations with a small population and thus easier to stabilize, the rest were considered failures. In Haiti and Cuba, brutal dictatorships arose from the United States callous nation-building efforts, and in Cambodia, Khmer Rouge seized power and caused the Cambodian genocides (1975-1979).^[25] Iraq, which intervention occurred after this report, soon witnessed mass chaos and the rapid rise of ISIL. And Afghanistan, whose future at that time was also unclear, proved to be one of the most disastrous military and political operations in recent memory.

This shows that while the United States was capable of eliminating their enemies (or at least temporarily), it could not resolve the subsequent power vacuum. Guerrilla fighters, as discussed in the first point, could never defeat the well-trained and technologically advanced United States military, yet they could harass the occupying force until it goes on a killing rampage (as shown in the My Lai Massacre and Operation Ranch Hand in the Vietnam War) or

ultimately abandon the campaign. The United States was unable to find a third alternative, so they were repeatedly forced to abandon the fruits of their efforts.

In addition, the United States was overly-optimistic of the people they presumed they were helping. In Iraq, the United States thought by toppling Saddam Hussein and providing funds to the provisional government, the Iraqi people could be free to establish their own democracy.^[26] It did not recognize the tensions between the Sunni and Shiite and the overall resentment towards themselves, and within a few years after its withdrawal, ISIL and Iraqi Kurdish forces immediately captured several major cities. In 2014, President Obama acknowledged that the United States underestimated ISIL forces and overestimated the provisional government.^[27]

More recently, the United States' over-optimism and confidence was on full display in Afghanistan. After spending 20 years and \$2.313 trillion in Afghanistan,^[28] the last United States military planes left Kabul on 30 August, 2021. What had been the Afghan provisional government disintegrated after President Ashraf Ghani's flight, and the Taliban had taken nearly full control of the country.

Iraq and Afghanistan are but two examples of the consequences of wishful illusions and assumptions, yet they serve to highlight the tremendous ignorance and over-optimism of the United States. These too are crucial to the United States' perfection of the art of losing wars.

The final factor that contributed to the United States' legacy of losing was its *sickly obsession with winning in the traditional sense*.

As discussed earlier, "meaningful victories" do not necessarily imply the attainment of military goals, but rather political goals. Military goals include the likes of capturing strategic bases, inflicting more casualties than sustained, and forcing negotiations favorable to oneself. The United States has repeatedly shown throughout history that it possessed the capacity to do so.

Sometimes the attainment of military goals can dictate the attainment of political goals. For example, in the Indian Wars, the United States massacred the Native Americans and thus acquired their lands. In the Spanish-American War, the United States overwhelmed the Spanish with its superior forces and achieved its political goals of acquiring new territories. In the two World Wars, the United States scored crucial victories in North Africa, Europe, and the Pacific and achieved its political goals of stemming the expansion of Imperial Japan and Nazi Germany.

In these wars, the United States dealt more damage to its enemies and therefore gained meaningful victories.

Yet there are instances when attainment of military goals does not equate to attainment of political goals. Below are some statistics of the five major wars the United States fought in after 1945: In Korea, over 460,000 North Korean and 600,000 Chinese troops were killed. Around 217,000 South Korean and 36,000 American troops were killed.^[29] In Vietnam, over 1.1 million North Vietnamese and Viet Cong fighters were killed. Around 250,000 South Vietnamese and 58,000 American troops were killed.^[30] In the Gulf War, an estimated 8,000 to 10,000 Iraqi troops were killed. In contrast, only 300 coalition troops were killed.^[31] In the Iraq War, although estimates vary the greatest, 100,000 to 200,000 Iraqi troops were killed. 4,500 American troops were killed.^[32] In Afghanistan, over 250,000 Taliban and ISIS fighters were killed. 177,000 Afghan national troops and 2,300 American troops were killed.^[33]

In all of these wars the United States inflicted more damage than their enemies. This pattern recurred despite the United States repeatedly failing to achieve crucial political goals. Instead, the lopsided difference in casualties between the United States and its enemies was not only lauded, but also sought for.

In Vietnam, the mission “*was not to win terrain or seize positions, but simply to kill ... victory was a high body count, defeat a low-kill ratio, war a matter of arithmetic.*”^[34] According to historian Christian Appy, “*search and destroy was the principal tactic; and the enemy body count was the primary measure of progress.*”^[35] Promotions were largely based on the number of kills, leading to widespread fraudulence as officers exaggerated numbers up to 100 percent.^[36]

Despite overwhelming evidence illustrating the impracticality of solely pursuing military goals after 1945, the United States has not seemed to learn its lessons. In his autobiography *My American Journey*, General Colin Powell wrote, “*Perpetual optimism is a force multiplier.*”^[37] To him and his fellow generals, war is like a football game where the side with the most points win.^[38] After the game, both sides walk off the field as if the entire issue is over. “*When we send the US Army somewhere,*” said General James McConville, “*we don’t go to participate, we don’t go to try hard; we go to win. That’s the American spirit. That’s what we do. There’s no second place or honorable mention in combat.*”^[39] In a 2011 speech in front of the American Legion, President Obama proudly spoke, “*Our Vietnam veterans ... let it be remembered that you won every major battle of that war. Every single one.*”^[40]

The word “winning” had clearly lost its definition. If winning means the loss of millions of lives for nothing, then the United States certainly won every war it has fought in. The United States embraced winning in terms of isolated battles, operations, and individual merits, but not the political objective of the war as a whole.

Furthermore, the belief that every scenario is winnable creates uncertainty when inevitable loss piles up. Fueled by the winning culture embedded in every military institution in the country, the United States could not afford losing. In response to losing, it could only employ extreme measures which appeal to its culture of winning. In Vietnam, the United States retaliated to the guerrilla tactics of the Viet Cong by launching Operation Ranch Hand (1962-1971)^[41] and Operation Rolling Thunder (1965-1968)^[42] which utilized mass bombing and agent orange. The rationale behind them was that sheer power can break the resolve of the militant resistance and thus pave the way to victory. In the words of General Curtis LeMay, the solution to the problem “*would be to tell them frankly that they’ve got to draw in their horns and stop their aggression or we’re going to bomb them back into the Stone Ages.*”^[43] Did the United States successfully destroy towns and forests? Yes. Did it achieve meaningful victories? No.

In a post-war survey of Army generals who served in Vietnam, 70% recalled the United States objectives as unclear, and 52% stated the objectives as unachievable.^[44] When expectation does not fit with reality, bewilderment and cynicism often take over. For all the winning culture the United States fostered through its educational and military forces, it did not leave any room to consider the possibility of losing.

The United States won nearly all major battles in its post-1945 wars. These military victories reinforced the cult of optimism and a winning culture amongst its ranks. However, the obsession over isolated incidents of winning prevented it from observing the war from a wider scope. Failure had become a matter of will and choice, so generals were often reluctant to admit their failing efforts (for example, in Vietnam, officers emphasized the body counts to conceal the reality that US troops were being pummeled by their unseen counterparts). Drastic measures were employed and chaos reigned, and before long the entire army was painfully awakened from the fantasy they had woven for themselves.

The United States has perfected the art of losing wars since 1945. It did so through an ignorance of the rapidly changing nature of warfare, wishful illusions and assumptions, and a sickly obsession with winning in the traditional sense.

This essay analyzed the three main components of the art and how the United States applied them in five major wars: the Korean War, Vietnam War, Persian Gulf War, Iraq War, and Afghanistan War. In these wars the most powerful army in the world faced poor peasants, untrained farmers, dispersed militants, and ill-equipped conscripts. Despite technological and geopolitical advantages, the United States fought against these people without any prior understanding of their culture and history. It did not understand their organizational structure, tensions, and desires. Bloated by past glories and its new role as a global superpower, the United States applied pre-1945 tactics only to miss its political goals, all the while befuddling its own troops and generating confusion. Contrary to Charles De Gaulle, who declared in 1940 that “*France has lost the battle, but France has not lost the war,*”^[45] the United States had won all of the battles but lost all of the wars.

The past few decades have seen not only the five major wars, but also military interference in numerous other nations.



Map 2:
US Military and CIA Interventions since World War II
■ targeted countries ✨ US bombings — US government assassination plots
Source: William Blum, *Killing Hope: U.S. Military and CIA Intervention Since World War II*, 2004 and *Rogue State*, 2005. (<http://www.killinghope.org/>)

The map above^[46] depicts various interferences of the United States since World War II. These interferences occurred in all continents, illustrating the extent to which the United States adhered to its role as the global policeman. Forms of interferences include civil wars, monetary

The only way the United States can emerge victorious under the present situation is to properly address its ignorance, fantasies, and sickly obsessions. If it truly desires to break the seemingly interminable series of humiliating defeats, it has to relinquish the art of losing war.

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To What Extent Does Marketing Propaganda Strategies Manipulate the Social Identity of Women in China? By Huqng Ziqi

“In a consumerist society, what we consume is not the usefulness of things, but the process of embodying our social status and identity through consumption, and therefore consumption is the structure of a symbolic system of meaning that is the basis of the legitimacy of modern capitalist society”. Consumerism Society-- Baudrillard

Aim of this research

The purpose of this study was to examine the impact of marketing propaganda on women's identity construction in China. Furthermore, I will evaluate the effectiveness, influences, and drawbacks of the predominant propaganda strategies. Existing models will define marketing propaganda strategies. Limitation of this method will be discussed later.

Development of this topic

Advertising is a kind of commercial propaganda and cultural communication, its content will influence and guide people's consumption, and implicitly affect consumers' lifestyle and even social ethos. The portrayal of women in advertisements will have a value-oriented effect that cannot be underestimated. It will affect the social perception and evaluation of modern women, people's thinking about gender relations, and the overall improvement and enhancement of women's status. With the high development of modern society, the communication of advertisements has penetrated every part of the society. This phenomenon eventually led me to exploring the topic question of this paper.

Introduction of research method

This paper will analyze different results from a variety of research methods. For primary research, an interview was carried out with a professional psychologist in the field of consumer psychology. For secondary research, I reviewed published journals on marketing propaganda strategies and construction of social identity of women for supportive evidence. For instance, published reports from China National Business data center(CNB) and China Internet Network Information Center (CNNIC) . Additionally, I read peer-assessed articles from reliable

organizations such as Data Center for China Internet (DCCI) in order to analyze the topic in different perspectives.

Initial stand and layout of this paper

My initial position in regards of this research paper is that, marketing propaganda strategy is not always telling the nature of the product but expanding a schema of sexism. Also, society expectation on femininity in terms of how women should behavior and look can be well reflected on those propaganda strategies. My opinion may sounds aggressive, but I am not criticizing consumption strategies. In fact, I acknowledge their usefulness regards to introduce products through different effective channels. However, I think the essence of marketing propaganda strategy has only helped a little.

To evaluate my position, this research paper will discuss the topic question in the following structure. This paper will first define “marketing propaganda strategies ” and “women identity”. Then, the results from the primary research will be analyzed. Next, the resources from the literature review will be explained and evaluated. Case studies of three Chinese famous brands will be compared and evaluated regards to their use of marketing propaganda strategies and how those made impact on women under different social expectation at different eras. To sum up this paper, the topic question will be revisit and justify my initial position of this paper. More importantly, this research paper will report what I have learned, what difficulties I have encountered when conducting my primary research and consolidating my literature review, what skills I have acquire when conducting a research paper. Also, what improvements I can make to make my research process more precise in order to investigate further of this topic as well as the field of consumer psychology and feminism.

Defining the topic question

This topic question aims to find out whether, and by how far, do different marketing propaganda strategies impact and manipulate the social identity of women. The two dimensions are very broad, therefore it is necessary to define them in this context. “Marketing propaganda strategies” refer to three classical advertising models : AIDMA, AISAS and ISMAS. The detailed explanation for the three model will be analyzed later in the literature review. The “social identity of women” is more difficult to define as there is no quantitative data or physical

models to visualized women identity. Thus, I decided to define this term in female consumer's behaviors, it includes how female consumers respond to the information conveyed by the advertisement; what factors will influence their consume behaviors and the motivation behind their consume behaviors. This is because consumption behaviors can reflect people's social status(Baudrillard). when making a consumption behaviors, consumers are in fact influenced by the social atmosphere.

Primary research: interview

To find out accurate first-hand information, the chosen interviewee was Zhai Hui Chao, a Chinese Academy of Sciences psychological consultant and professional EFT emotional release technology trainer from World Medical Executive Certification Center. Mrs.Zhai is specialized in consumer psychology, therefore, the quality of her response can be guaranteed.

Question1: In your opinion, do you think Pink Tax is a Consume Scam? Pink Tax is a phenomenal consumerism strategy in China. Therefore, this question is aimed to investigate the possible mechanism behind such representative marketing strategy. The interviewee replied that Pink Tax is in fact a marketing technique that aimed at both genders, except that for women we would see the problem more easily. This phenomenon exists because businesses have done a lot of preliminary data research, which shows that raising prices can be profitable, so they make this decision. Therefore,the pink tax can't simply be summarized as sexism on an economic level; it's backed by a much larger and abstract algorithm and marketing strategy. On the one hand consumers go on their own to consume more expensive products, and on the other hand they are also influenced by the brainwashing of advertising. In other words, the consumerism mechanism can be well reflected here.

Question2:In your opinion, Why is there a gender differences in commodities? And what impact it will have on our identity positioning? This question is aimed to explore how can commodities influence people's perception of themselves. The interviewee respond that the gender differences in commodities can be explained from the perspective of biological evolution.For example, men in the evolutionary process of evolution favor the decision-making and rational side, so the audience of products related to cars or watches is mostly men. The steering wheel of a car is actually a metaphor for male decision-making power. Also, we see that society's expectation of women's "femininity" comes from their fertility.This issue is actually

related to the consumer schema behind consumer products. The Masculinity and Femininity conveyed by the advertisement or commodities are also included within this schema carried by consumer products. Consumerism uses different advertising and marketing techniques to consolidate the social stereotypes of gender, so as to better delineate the circle.

Question 3: Can women reconstruct female identity through consumption, and does it in a sense re-enforce gender issues? This question is aimed to find out the relationship between female identity and consumption. The interviewee respond that this issue is related to the contemporary feminist issues. As women have equal access to education, more women in society speaking out and rising up for the affirmative action movement. In the relatively patriarchal world of today, those in power may use business like advertisement to manipulate women's perception. The interviewee acknowledged that advertising has a positive effect on businesses and consumers, but when advertising has become more than simply promoting the nature of goods but has begun to spread a certain awareness, each of us must look at it with alarm.

Useful evidence from the interview

Ms. Zhai perspective well matched my initial position of this paper, that marketing propaganda strategy is strongly influenced female consumer regards to their consumption behaviors. More importantly, she mentioned that consumerism is actually reinforce the stereotypical social expectation of "femininity". For instance, business will construct the consumerism spectacle for consumers to paralyze themselves. That is, by using correspond marketing practices, consumers are being induced to purchase products.

The established notions of gender in society are in fact largely derived from different consumerism spectacles rather than from our own conscious construction. Thus, it can be seen that the construction of woman's identity may be largely influenced by the schema of consumerism and its commercial marketing practices. This finding in the primary research lead to a modification of the research question. Initially, my topic was written as "To what extent has Consumerism manipulated women identity in China". However, I realized that "consumerism" is too broad and is hard to examine. After condensed the information gathered from the interview, I found that the sexualization of commodities, the consumer behavior of female consumers and the consumer tactics of merchants are all related to the huge and invisible marketing system behind them. Therefore exploring different marketing models specifically can help me analyze how

female consumers are influenced with more confidence. I decided to narrow down the topic into the “marketing strategy of advertisement”. By having this information in the primary research, an in-depth secondary research will be present to evaluate and verify her statement.

Literature review

Evaluation on the persuasion model

The essence of advertisement is about the action of persuading consumer. “Human communication that is designed to influence others by modifying their beliefs, values, or attitudes” (Simons, 1976, p. 21) Carl Hovland proposed a model of persuasive communication (Sherif & Hovland, 1961; Sherif, Sherif, & Nebergall, 1965) that explained the persuasion of advertising is reflected in the positive attitude and purchase behavior of consumers towards the product through mass media. Advertisement uses Emotive, connotative and create specific atmosphere to attract consumer’s attention. Under this context, the consumer is the recipient of message conveyed by advertisement.

Evaluation on the essence of advertisement

For advertising of a commercial nature, Advertisement is a social division of labor that undertakes the task of running society. Therefore, advertising has a precise definition and criteria. The first key point of advertising is: to inform. If an advertisement does not clearly communicate the message it contains, it is an ineffective advertisement. After fulfilling its most basic purpose, an advertisement needs to state its merits in order to make consumers feel good about the brand or product and thus make a purchase. The American Advertising Association defines advertising as: advertising is a paid mass communication whose ultimate purpose is to convey information, change people's attitude toward the advertised goods, and induce them to act in order to benefit the advertiser. Chen Pei-ai, a scholar in China, believes that advertising is a public, non-face-to-face, paid information dissemination activity in which advertisers, individuals or organizations repeatedly convey a specific coded message to a target audience in an appropriate symbolic form through a certain communication medium in order to influence or change the target audience's perception or behavior.

There are three representative advertisement models : AIDMA, AISAS and ISMAS. The transform in marketing models correspond to the evolution of the internet from web 1.0 to web 3.0. The literature review is expected to investigate how the three stages of internet evolution influenced the effectiveness of the corresponded models; How the models physically and psychologically manipulated female consumer's behaviors. The validity of the literature review will be evaluated later in the reflection.

Evaluation of the AIDMA model

Under the era of web 1.0, AIDMA model was coined by American advertising and sales pioneer Elias. St. Elmo Lewis in the late 1800s. Marketers use this model to attract customer to purchase a product. The acronym AIDMA stands for Attention, Interest, Desire Memory and Action.

The advertisement in the AIDMA stage will make the potential consumers "notice" the advertisement message, and make them feel "interested" and continue to complete the reception of the advertisement message, and then produce the "desire" to try to buy or experience "The constant repetition of advertising words facilitates consumers to "remember" the message more deeply until the "action" is transformed into purchase behavior. They take advantage of consumers' herd mentality and the resonance effect. The sources of herd mentality are mainly divided into :

Consumers' incomplete perception of the product: The AIDMA model is a good response to the marketing relationship in the traditional media environment. Television, radio, newspapers and magazines provide people with a vast array of news, entertainment and consumer information. Under this centralized communication technology, the public, as passive recipients of information, has no means to express their personal opinions. Their demand towards the advertisement can only be 1) Buy, 2) Do not buy, 3) Can not buy. According to the study conducted by Zhou Yong and HuangYa Lan(2020), when people act as passive receivers of information, they tend to be more easily influenced by the information they received. In a state where information is completely monopolized, people are often unable to discern the accuracy of the information.

Social atmosphere and group pressure: Chinese culture is a typical collectivist culture, so Chinese consumers are largely influenced by others when making purchase decisions.(Guo

GuoQin,2010) It has been pointed out that Chinese people are socially oriented, their behavior tends to obey social expectations, and look for external opinions and social acceptance. Therefore, AIDMA model enhanced the group pressure.

Between the era of 1990-2000, Men dominate the public sphere and do not approve of the social roles women play.(Wang Lei,2018) As a result, women have gained political power and social status while being influenced by the media's perception of the "good wife and mother". The media takes advantage of the AIDMA model to manipulate women's identity.

How does this model influenced women identity construction?

Wang Lei's research (Media,Power,Gender and Chinese feminist, 2018) showed that people tend not to easily question the information conveyed by the products because traditional advertising and marketing methods are based on information monopoly. Consumers cannot compare themselves and refer to other product information. The image of women under traditional advertising is mainly divided into:

1. Male appendages: 69.5% of car and wine advertisements (n=267) always show women as ornaments, as a way to highlight the status of the male pose. Such advertisements invariably exaggerate the differences between male and female categories and devalue the role and contribution of women in social life.
2. The paragon of a virtuous wife and mother: 57.45%-77.1% of the advertisements for household and kitchen products (n=245) show women as gentle and virtuous, loving mothers, who are always accompanied by children and husbands. The image of women in these advertisements catered to the society's image of women at that time. The advertisements downplayed woman's occupations and their social responsibilities, and they were more often depicted as virtuous wives and mothers who were busy with their families.
3. In the position of seeing and being seen: The 3B principle(Beauty,Beast and Baby. This principle was proposed by David MacKenzie Ogilvy) is used a lot in advertising and marketing. In advertising, women are on the side of being watched, and their bodies and looks become the focus of attracting men to watch. In ads for stockings, cosmetics, clothing, toiletries, etc., the image of women is objectified. They become a packaging and selling point.

Advertisements exaggerate the value of women's external beauty, resulting in perverse aesthetics: Since the dominant cultural values of society have been emphasizing the importance of women's external beauty, advertising campaigns mostly regard women's appearance as the embodiment of their full value. It attempts to prove that changing appearance can change life and fate. In addition, it leads to a misunderstanding of beauty, and people narrowly understand beauty as an "external image". The advertisements show women as housewives, which weakens women's awareness of competing and achieving in society, which inevitably affects women's self-seeking.

Market produces certain kinds of consumer positions that consumers can choose to inhabit. While individuals can and do pursue personally edifying goals through these consumer positions, they are enacting and personalizing cultural scripts that align their identities with the structural imperatives of a consumer-driven global economy.

AISAS model in advertisement

The advent of internet and the wireless application era has strongly influence the consumer behavior. AIDMA model transformed and evolved into AISAS. It stands for Attention, Interest, Search, Action and Share. This model was proposed by Japan Dentsu company in 2005. The importance of Search and Share in the Internet era, rather than just instilling one-way ideas to users, fully reflects the impact and change of the Internet on people's lifestyles and consumption behavior. According to Dentsu's survey data, at the stage of product awareness, consumers' information sources are mainly TV, newspapers, magazines, outdoor, Internet and other media advertisements; at the stage of understanding products and comparing and discussing and deciding to buy, besides visiting stores, Internet and word-of-mouth are their main information sources and decision bases.

The 39th Statistical Report on the Development of China's Internet in Beijing released by China Internet Network Information Center (CNNIC) showed that the size of China's Internet users reached 731 million and cell phone users reached 695 million. In terms of absolute population and contact hours, these up-and-comers have reached or even surpassed traditional media such as TV and newspapers. Internet provided more channels for users to actively acquire information. When it comes to "search" and "share", the emergence of the Internet has provided great convenience for consumers to actively obtain information, and consumers can search on the

Internet during the purchase process, collect information on commodities as a basis, and then decide their purchase behavior. Reports of CNNIC show that information retrieval of commodities is always one of the main uses of the Internet by Internet users. Second, the popularity of BBS, blogs, SNS and other technology platforms also gives people the right to publish information, so that in the process of consumer consumption, they can also share information with more consumers as the subject of publishing information to provide a basis for other consumers' decisions.

The notion of Web 2.0 had strongly impacted the consumer system and people's consumption concept. The transition from AIDMA to AISAS indicated the change from advertisement stimulate consumption to personalized consumption. That is, consumer behaviors gradually evolved into an active information recipient. Based on the CBN data, 77% of the female consumer refer to product reviews written by others online before purchasing a product online; more than 90% of large companies believe that user recommendations and Internet users' opinions are very important in determining whether a user makes a purchase. This means that before making a purchase, consumers start to think about more factors, which is a significant difference compare to the AIDMA model.

ISMAS in advertisement

ISMAS, proposed by Professor Liu Dehuan of Peking University, is an improved model for the traditional theoretical model based on the change of people's life pattern in the mobile Internet era (especially the increase of users' initiative). That is: Interest, Search, Mouth, Action and Share. This transition is more significant than the last shift as the media-centric marketing model is transformed into a consumer-centric one. The age of "media" is transformed to an age of "de-media" so media has become both insignificant and trivial, the meaning of people is no longer a digital indicator behind the system, and the value of individual is restored.

Compared with the AISAS model, the ISMAS model places more emphasis on the "human-centered" consumption model. Through the Internet, we can pinpoint the target group, interact with consumers and get their feedback. Likewise, with the Internet, consumers have more channels to share their consumption experience and have more channels to get information about products before shopping. Therefore, compared to the AISAS model, the ISMAS model better reflects the two-way interaction between consumers and merchants. This interaction shows

a good reflection of consumers' self-awareness. In addition, ISMAS model represents a complete transition from being a passive recipient of advertisement information to an active information selector .

The data extracted 7% of the online female consumers information (i.e age,consumption behaviors and consumption tendency) by random sampling. The longitude of the study last for 3 years, from 2016 to 2018. It shows that 40% of the female consumer purchase makeups product out of self-expression and self-pleasure. In terms of the clothing, materials, aesthete value and brand's concept are the three main consideration when female consumer purchasing. They started to prioritize the quality of clothing and the brand's core concept as a oppose to cheap price. Also, they will spend more time to compare and ask for official advice from KOL in order to chose the fit product for them. Female consumers no longer overly consider social expectations when making purchase decisions, but rather look at themselves.

In ISMAS model, “Mouth” and “Share” allowed consumer to be involved in the process of advertising. Word-of-mouth communication is gradually becoming the core point of the marketing system. It leads to the development of key opinion leaders(KOL). Based on ZhengRong's research(ZhengRong,2015),97% of female consumers use the Internet for an average of one hour per day, and 77% of female consumers say they have made a purchase because of a recommendation from a KOL, whose professionalism, popularity, product relevance and interactivity are all factors that female consumers look for when getting shopping recommendations. The American psychologist Bandura proposed in his social learning theory that in a social group, people will easily notice people with certain social status, higher ability and greater power (i.e. role models), and will consciously or unconsciously imitate and learn their behavior because of their admiration and admiration for the role models.(Bandura, 1973) Therefore, the appearance of celebrities in advertisements will attract consumers to pay attention to them, pay attention to them and buy the products they recommend in the expectation of obtaining similar consumption behaviors as celebrities. By emphasizing "Mouth", it is easier for consumers to identify whether the product itself matches.

Conclusion

Marketing strategies are strongly interrelated to the development of internet. For consumers, the advent of the Internet has dramatically changed the way they receive information. For example, in the Web 1.0 era, traditional media coupled with AIDMA model, still monopolized the information market, and the inequality of product information led consumers to rely heavily on external factors (e.g., social expectations, group effects) to purchase products. This led to consumers not having a complete knowledge of themselves. Since web 2.0, consumers have been able to actively collect and find relevant product information to make consumption behaviors out of their own needs. By the time of Web 3.0, consumers became active collectors of information and were even fully integrated as part of the ISMAS model (Word-Of-Mouth and Sharing in the ISMAS model). This means that consumers' subjective opinions become an important part of the advertising campaign. The marketing model has also changed from "absolute media dominance" to "consumer influenced media". The process of moving from passive to active represents the awakening of female consumers' self-awareness. As CBN data shows, the Web 3.0 era has entered the era of "Her Consumption", and more female consumers will give priority to their own needs rather than external expectations, such as society's expectations of "beauty" and "femininity"(The beauty myth,Naomi Wolf,2015) when making purchase decisions. Therefore, the emergence and rapid development of the internet has reduced the control of marketing strategy over female consumers and has had a positive impact.

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Appendix

Primary research: interview in full script

Question1: In your opinion, do you think Pink Tax is a Consume Scam?

Response: I wouldn't easily consider it as a scam, because this marketing technique is actually aimed at both genders, except that for women we would see the problem more easily. This phenomenon exists because businesses have done a lot of preliminary data research, which shows that raising prices can be profitable, so they make this decision. Therefore, the pink tax can't simply be summarized as sexism on an economic level; it's backed by a much larger and abstract algorithm and marketing strategy. But I must admit that, in my personal experience, the pink tax does put a lot of thought into the advertising strategy, so that on the one hand consumers go on their own to consume more expensive products, and on the other hand they are also influenced by the brainwashing of advertising. In other words, the consumerism mechanism can be well reflected here.

Question2: In your opinion, Why is there a gender differences in commodities? And what impact it will have on our identity positioning?

Response: I think the gender differences you mentioned can actually be explained from the perspective of biological evolution. For example, men in the evolutionary process of evolution favor the decision-making and rational side, so the audience of products related to cars or watches is mostly men. The steering wheel of a car is actually a metaphor for male decision-making power. Also, we see that society's expectation of women's "femininity" comes from their fertility. My explanation may sound gender stereotypical, but most businesses do use this supposed difference between men and women to target different audiences. Of course, this issue is actually related to the consumer schema behind consumer products. The so-called masculinity and femininity I mentioned earlier are also included within this schema carried by consumer products. Why do we think the first audience for cars is male? Why do we think that the first audience for cosmetics is female? What lies behind these questions is a consumption landscape. Consumerism uses different advertising and marketing techniques to consolidate the social stereotypes of gender, so as to better delineate the circle. As for why, I think the reasons behind this are more complex. advertising and marketing techniques to consolidate the social

stereotypes of gender, so as to better delineate the circle. As for why, I think the reasons behind this are more complex.

Question 3: Can women reconstruct female identity through consumption, and does it in a sense re-enforce gender issues?

Response: I think this question goes well to the heart of contemporary feminist issues. For example, now that women have equal access to education, you see more groups of women in society speaking out and rising up for the affirmative action movement. In the relatively patriarchal world of today, if those in power want to erase these so-called threats and rebellions, they have to satisfy women in other ways so that they will gradually forget about their demands and appeals. When I say "other aspects", I mean consumption behavior. Businesses use a lot of advertising techniques and propaganda to scrub women's perceptions of consumer behavior over and over again. The vast majority of women in society actually fall into this consumer trap. For example, they may think that owning a designer brand's bag is a better way to show their status than reading a book. So I don't think that women can gain a so-called understanding of their self-identity simply by consuming. As I answered in the first question, you can't discount the overwhelming marketing techniques in society. I acknowledge that advertising has a positive effect on businesses and consumers, but when advertising has become more than simply promoting the nature of goods but has begun to spread a certain awareness, each of us must look at it with alarm.

How are mRNA Vaccines Different From Other Vaccines and how can They be Improved to Prevent More Diseases? By Dipanshu Verma

Abstract

This paper aims to summarize mRNA vaccines and how they can open up pathways in medical science that can revolutionize the way we combat infectious diseases. mRNA vaccines offer a glimmer of hope for deadly diseases across the world and with more research being done, some of the most infectious diseases could be prevented in the future.

Purpose

Messenger RNA—or mRNA—exists in all of the cells in your body. It is an essential component of all living organisms and has been in cells for billions of years. This Review provides a detailed overview of mRNA vaccines and considers future directions and challenges in advancing this promising vaccine platform to widespread therapeutic use.

Future Implications of mRNA Vaccines

It wasn't long ago when the future of mRNA vaccines looked bleak as there was very little research being done on them. However, after the Covid-19 pandemic, more research than ever before is going into developing mRNA vaccines for other diseases like cancer and HIV.

Challenges/Gaps with mRNA Technology

Challenges that impede the successful translation of molecules into drugs are that (i) mRNA is a very large molecule, (ii) it is intrinsically unstable and prone to degradation by nucleases, and (iii) it activates the immune system. **Future Perspectives and Suggestions to Address Gaps**

Advanced delivery systems can be applied to overcome the poor stability, cell targeting, and translational efficiency of naked mRNA. However, many clinically tested mRNA vaccine candidates are formulated without any delivery system, which suggests a need for further improvement of delivery systems for mRNA vaccines. The Covid-19 pandemic brought more spotlight into mRNA vaccines than ever before. As a result, further research is being done in order to develop mRNA vaccines for other diseases. Although there are problems with immunity and allergic reactions, mRNA vaccines show promise in even defending the immune system from the most deadly of diseases such as HIV and Cancer.

Introduction

Vaccines are one of the greatest medical science advances in history as they have been able to protect millions of people across the globe from infectious diseases. The first vaccine ever developed was the smallpox vaccine in 1798 (“A brief history of vaccination”, 2020). Since then, there have been vaccines developed for 18 different diseases (“Vaccines by Disease”, 2022). Immunization from vaccination saves an estimated 2 to 3 million people globally each year (Vanderslott et al, 2019). Vaccines have even eradicated two diseases, smallpox and rinderpest, that were once thought to be some of the most deadly diseases in the world (Greenwood, 2014).

Vaccines are typically administered using injections through the arm. However, vaccines can also be administered through the mouth using droplets or through the nose using a nasal sprayer (“Administer the Vaccine(s)”, 2021). There are many different types of vaccines and although these vaccines work in different ways, they all spark an immune response from the body. Vaccines act as a way to alert the immune system of harmful pathogens that can cause disease so that in the future, the immune system will be able to easily handle that virus/disease. Typically, vaccines help to combat diseases using T and B cells. Specifically, vaccines trigger the production of B-cells which produce antibodies. Antibodies are proteins that bind to antigens (molecules from pathogens that induce immune response) (“How do vaccines work?”, 2020). Antigens are often proteins that allow certain viruses and bacteria to infect cells or replicate themselves. By binding to antigens, antibodies prevent further cells in the body from being harmed. This is because antibodies block antigens and the activation of these proteins to cause further damage or replicate in the immune system. There are two main types of T-cells: Killer T-cells and Helper T-cells. Killer T-cells are the cells that destroy infected cells in order to prevent the spread of infection. Killer T-cells find infected cells and bind to the antigen. The Killer T-cell then releases perforin and cytotoxins. Perforin is a protein that is used to make a hole in the membrane of the infected cell. Cytotoxins are toxic agents that Killer T-cells use in order to go inside the hole and destroy the infected cell. Helper T-cells send messages to Killer T-cells and B-cells about where the virus is present. They also instruct Killer T-cells to replicate in order to prevent the immune system from an invading virus (Dr. Biology, 2011). Different people can respond to vaccines in different ways. This is mainly due to a molecule known as MHC. The job of MHC molecules is to bind to antigen fragments from the vaccine (Janeway et

al, 2001). However, the MHC molecules and variety of MHC molecules can differ from one individual to another. MHC is used for T-cells to recognize the antigen and destroy it and store it in their memory. However, if two individuals have different amounts of MHC, then they will have different amounts of T cells able to recognize the antigen and prevent it from spreading/mutating (“Immune Response to Vaccine Antigens”, 1997). As a result, everyone doesn’t respond to vaccines in the same way.

Vaccines have six main types of ingredients: preservatives, adjuvants, stabilizers, residual cell culture materials, residual inactivating ingredients, and residual antibiotics (“What’s in Vaccines?”, 2019). Preservatives, like thimerosal, help to prevent contamination by protecting the vaccine from outside bacteria. Adjuvants, like aluminum, help boost the immune response to the vaccine, which helps to increase immunity to a particular disease. Stabilizers, like sugar or gelatin, help to keep the vaccine effective after manufacturing. Therefore, changing factors, such as a change in temperature, won’t affect the vaccine’s effectiveness. Residual cell culture materials, like eggs, help to grow the antigens of the vaccine. Residual inactivating ingredients, like formaldehyde, weaken or kill viruses in vaccines so they don’t become contagious when inserted into the body. Lastly, residual antibiotics, like neomycin, also prevent contamination by preventing outside bacteria from growing inside the vaccine (“Vaccine Ingredients”, 2021). Covid-19 is an infectious disease caused by the SARS-CoV-2 virus that caused a worldwide pandemic. As of July 23, 2022, there have been over 560,000,000 cases and over 6,300,000 deaths worldwide (“Covid-19 Dashboard”, 2022). The first US Covid-19 cases were announced on January 20, 2020 (“CDC Museum Covid-19 Timeline”, 2022). However, the first doses of the vaccine were given out in December of 2020 (Cullinane et al, 2020). The first Covid-19 vaccine developed was approved by the FDA on August 23, 2021 (“FDA Approves First Covid-19 Vaccine”, 2021). Most vaccines take over 10 years to develop, yet the Covid-19 vaccine only took 19 months. For example, Hepatitis B, a common liver infection, was discovered in 1965. Although the first vaccine was created in 1969, it wasn’t until 1981 when the FDA approved the vaccine and it became commercially available (Colarossi, 2020). The Covid-19 vaccine was the fastest vaccine ever developed. Although development of the vaccine was increased due to the worldwide pandemic, a big reason why the vaccine developed so quickly was due to the fact that it was an mRNA vaccine (Cohen, 2020). mRNA vaccines have been shown to be cheaper and faster ways to combat infectious diseases and may even open up the opportunities to cure

“incurable” diseases such as cancer and HIV.

What is an mRNA Vaccine?

mRNA vaccines use a molecule called messenger RNA. mRNA is used for protein production. In cells, mRNA uses the information in genes to create a blueprint for making proteins. Once cells finish making a protein, they quickly break down the mRNA (“What are mRNA vaccines and how do they work?”, 2022).

mRNA vaccines work by introducing a piece of mRNA that corresponds to a viral protein. Viral proteins are proteins that are generated by a specific virus. Using this mRNA blueprint, cells produce the viral protein (“Understanding mRNA Covid-19 Vaccines”, 2022). The immune system is able to then recognize that the protein is foreign and produces antibodies to help destroy the pathogen. The antibodies remain in the body so that the immune system can quickly respond if exposed again (“What are mRNA vaccines and how do they work?”, 2022). Rather than using a pathogen to initiate an immune response, mRNA vaccines use mRNA to make a protein from a virus in order to initiate an immune response. This allows mRNA vaccines to be much safer and more effective when compared to other vaccines as there is no chance of a pathogen mutating and causing unforeseen damage to the immune system (“What are mRNA vaccines and how do they work?”, 2022). Additionally, mRNA vaccines are much easier to manufacture. These vaccines don’t require the use of live viruses or cell cultures, which creates a much safer and efficient production process. For example, the Covid-19 vaccines only took approximately a year to create and over 12 billion doses of the vaccine have been administered across the world (Rosa et al, 2021).

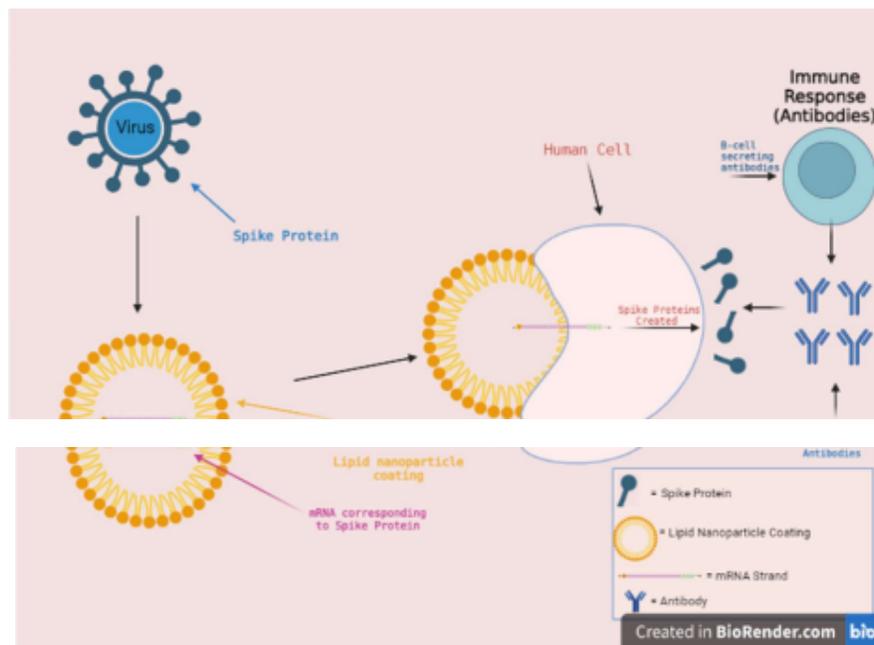
mRNA vaccines use modified nucleotides (structural components of DNA and RNA) to activate immune responses through the production of protein. However, there have been issues with low stability and degradation when it comes to mRNA vaccines. As a result, many mRNA vaccines use lipid nanoparticles in order to facilitate cellular uptake and release (Jain et al, 2021). When developing a vaccine for Covid-19, researchers found mRNA vaccines to be most efficient and effective. Inactivated vaccines for Covid-19 were ineffective for two main reasons: limitations in production and incorrect protein targeting (Krammer, 2020). Inactivated vaccines need to be developed in biosafety level-3 laboratories and there are only a limited number of laboratories that have this biosafety requirement (Li et al, 2022). Additionally, since the whole

virus is present in the vaccine, immune responses would not just target the spike protein, but the whole protein of SARS-CoV-2(Krammer, 2020). Live-attenuated vaccines were also ineffective as they require a lot of modification as there is a possibility of the virus reverting to its original form(Li et al, 2022). Protein subunit vaccines were also ineffective as the protein used in the vaccine didn't have enough epitopes to ensure it would attach to the antigen. This would cause a risk in the virus mutating with the antigen not being attached to an antibody(Krammer, 2020). All of these concerns plus the fact that most laboratories and pharmaceutical companies were in a hurry to develop an efficient Covid-19 vaccine as fast as possible shot down the possibility of other types of vaccines being used other than the mRNA vaccine.

Currently, mRNA vaccines are able to treat Covid-19, rabies, Zika, cytomegalovirus, and influenza. Additionally, mRNA vaccines are only able to make one type of protein for each virus they treat(Jain et al, 2021). With further research, mRNA vaccines have the potential to create multiple proteins for each virus and that would allow antibodies to target different aspects of viruses. This can lead to a whole new field of treatments and better health for everybody.

Fundamental Pharmacology of mRNA Vaccines

Figure 1: Diagram of How mRNA Vaccine Work



Once the mRNA vaccine goes into your arm, the mRNA tells immune cells how to build the specific protein of the virus(“How mRNA vaccines work”, 2020). First, an mRNA strand

corresponding to the spike protein is surrounded by a lipid nanoparticle coating in order to prevent degradation(Li et al, 2022). The mRNA strand is then transcribed into an immune/human cell so that the specific protein of the virus can be made using instructions from the mRNA. B-cells then start to send out antibodies as the immune system doesn't recognize the protein. The antibodies then destroy the proteins and build up memory so that it can recognize the protein in the future("How mRNA vaccines work", 2020). This helps to create immunization from a virus in the immune system.

Future Implications of mRNA Vaccines

It wasn't long ago when the future of mRNA vaccines looked bleak as there was very little research being done on them. However, after the Covid-19 pandemic, more research than ever before is going into developing mRNA vaccines for other diseases like cancer and HIV. mRNA vaccines have shown to be much safer and efficient compared to other vaccines(Jain et al, 2021). However, there are still some problems that have to be resolved in order to develop future mRNA vaccines.

There have been some serious concerns regarding immunity for mRNA vaccines. This can be best evidenced by the recent Covid-19 vaccines. A study published in *Science Translational Medicine* found that Covid-19 vaccine generated antibodies dropped significantly after 6 months, leading to declining immunity. Additionally, the study revealed that the vaccine produced less protection against SARS-CoV-2 variants such as Delta and Omicron(Evans et al, 2022). This is due to the fact that the mRNA vaccine trains the immune system to produce antibodies against spike proteins from the SARS-CoV-2. The spike protein is the main focus of mRNA vaccines as it allows the virus to enter our cells. Once the virus enters the cells, virus replication can occur which causes further damage to the immune system. As a result, the goal of Covid-19 vaccines is for the antibodies produced from the vaccine to recognize the spike protein so that the virus can't enter the cells in the first place(Caddy, 2020). However, Omicron and Delta have slightly mutated spike proteins that the antibodies aren't able to recognize(Kumar et al, 2021).

Additionally, there have been cases of allergic reactions to the Covid-19 vaccine. This has been due to the polymer polyethylene glycol used to stabilize the lipid nanoparticles of the vaccine. Lipid nanoparticles are impure and need a polymer in order to help with stabilization.

Due to the rush in creating the Covid-19 vaccine, not all polymers were tested for stabilization. Future mRNA vaccines must make sure to use stable polymers that significantly decrease the chance of an allergic reaction(Jain et al, 2021).

Additionally, mRNA vaccines need to be stored in cold conditions. For example, Pfizer's Covid-19 vaccine needs to be stored at a temperature between -80o C and -60o C for up to 6 months before being administered. This can cause a serious problem to low income countries that are in an energy crisis or don't have adequate equipment in order to ensure the stability of mRNA vaccines(Ali et al, 2021).

Despite all this, there is still a lot of promise for mRNA vaccines when it comes to deadly diseases like HIV and Cancer. There have always been issues when it comes to developing an HIV vaccine due to the high mutation rate as well as the difficulty in generating long-term antibodies for the virus(Jain et al, 2021). However, an mRNA vaccine was recently developed that resulted in a high amount of HIV-binding antibodies. The first human clinical trials were led by Moderna in May 2022, and they revealed that 97% of recipients were able to produce HIV neutralizing antibodies. However, the antibodies were only responsive to 30% of HIV strains. Although these weren't the results hoped for, it still shows a lot of promise for future mRNA vaccines for HIV(Cosdon, 2022).

Similarly to HIV, Cancer vaccines have also always been hard to develop due to the high mutation rate and versatility of the disease(Jain et al, 2021). However, mRNA has been used to develop vaccines based on mRNA pulsed dendritic cells, which present tumor antigens in order to develop an immune response. Tumor regression was shown from this study and mRNA is still being studied as a way to combat cancer(Boczkowski et al, 1996). Although future research has to be done, mRNA vaccines show potential for both HIV and Cancer(Jain et al, 2021).

Challenges/Gaps with mRNA Technology

In the past few years, there has been increasing focus on the use of messenger RNA (mRNA) as a new therapeutic modality. Current clinical efforts encompassing mRNA-based drugs are directed toward infectious disease vaccines, cancer immunotherapies, therapeutic protein replacement therapies, and treatment of genetic diseases. However, challenges that impede the successful translation of these molecules into drugs are that (i) mRNA is a very large molecule, (ii) it is intrinsically unstable and prone to degradation by nucleases, and (iii) it

activates the immune system. Although some of these challenges have been partially solved by means of chemical modification of the mRNA, intracellular delivery of mRNA still represents a major hurdle. The clinical translation of mRNA-based therapeutics requires delivery technologies that can ensure stabilization of mRNA under physiological conditions.

Future Perspectives and Suggestions to Address Gaps

The field of mRNA-based therapeutics spans from protein replacement therapy and gene editing to vaccination. With the dozens of mRNA-based vaccine candidates currently in pre-clinical and clinical phases of development, it is evident that the mRNA-based vaccine technology is a promising tool for the development of novel therapeutic and prophylactic vaccines against infectious diseases and cancer. However, the multifarious obstacles associated with mRNA's extremely large size, charge, intrinsic instability, and high susceptibility to enzymatic degradation hamper the translation of mRNA-based therapeutics from the bench to the bedside. Therefore, the wider application of mRNA-based therapeutics is still limited by the need for improved vectors or drug delivery systems. Advanced delivery systems can be applied to overcome the poor stability, cell targeting, and translational efficiency of naked mRNA. However, many clinically tested mRNA vaccine candidates are formulated without any delivery system, which suggests a need for further improvement of delivery systems for mRNA vaccines. Presently, lipoplexes and lipid-based nanoparticles are mostly used for delivering mRNA. Additionally, polymers and lipid-polymer hybrid nanoparticles offer great promise in terms of safety, stability, high transfection efficiency, and low price. Continued advancement in mRNA formulation and delivery using different nanomaterials can improve the wider use of mRNA for the treatment and prevention of infectious diseases and cancers.

Conclusion

Vaccines have always been a critical part of human health and there are various types of vaccines. These include inactivated vaccines, live attenuated vaccines, subunit vaccines, and mRNA vaccines. All of these vaccines have their own functions and purpose. However, the vaccine with the most potential is the mRNA vaccine. The Covid-19 pandemic brought more spotlight into mRNA vaccines than ever before. As a result, further research is being done in order to develop mRNA vaccines for other diseases. Although there are problems with

immunity and allergic reactions, mRNA vaccines show promise in even defending the immune system from the most deadly of diseases such as HIV and Cancer.

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