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EFFECTS OF DOBUTAMINE AND ISOPRENALINE ON HEART RATE AFTER DRUG ADMINISTRATION AND INDUCED CADIAC STRESS TEST

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Abstract:

Purpose; *The Purpose of this research is to investigate potency of Isoprenaline, Dobutamine and adrenaline as agonist drugs at absence and presence of the antagonist drugs; that is Metoprolol and prazosin.*

Methods; *The study employed a total of 30 participants aged between 25 and 45 years who were suffering from cardiovascular disease and two distinct stress test were conducted; that is the drug-induced test and the control-induced test.*

Results; *Dobutamine is found as the most stable agonist drug as compared to both Isoprenaline and adrenaline. When Isoprenaline and adrenaline agonist drugs are prescribed at high levels or dose, their effectiveness decreases while Dobutamine agonist when prescribed at higher levels or dose its effectiveness increases. Further, from the results, Metoprolol is found as better antagonist drug as compared to Prazosin drugs. In addition, a high level or dose of Dobutamine agonist drugs is needed to neutralize the impact of Metoprolol drugs. On the other hand, Prazosin drugs impact is very weak to block activities of the Dobutamine drugs. In exercise-induced stress test, it is clear that Metoprolol drugs are better antagonist drugs than Prazosin drugs. This is because, Metoprolol drugs significantly lowers individual's heart rate where Prazosin drugs neither shows an increase nor a decrease in the heart rate.*

Conclusion; *Isoprenaline and adrenaline are better and appropriate agonist drugs when prescribed at a lower dosage. However, Dobutamine drugs are better and appropriate agonist drugs as compared to Isoprenaline and adrenaline drugs when prescribed at higher dose. Metoprolol is a better antagonist drug as compared to Prazosin drugs since it is able to block activities of the Dobutamine drugs at a low to moderate dose.*

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INTRODUCTION:

Though the heart has some autorhythmic cells, heart rate is usually regulated by parasympathetic and sympathetic nervous systems of autonomic nervous system. The parasympathetic nervous systems release acetylcholine to slow the heart rate down (Stabler, 2009). Agonists and antagonists drugs act on the acetylcholine by decreasing or increasing its activities. These two types of drugs act on muscarinic receptors, such as the smooth muscle, glands, and cardiac muscle.

Dobutamine and adrenaline is muscarinic receptors agonist and increases the activity of the acetylcholine, which is released by parasympathetic nervous systems hence slowing down the heart rate. Isoprenaline, on the other hand, is muscarinic receptor antagonists which blocks or inhibits acetylcholine released by the parasympathetic system. It permits heart rates to increase (Saad, Guarda, Camargo, Santos, Saad & Guarda, 2003).

A stress test is a crucial cardiovascular testing that entails the use of treadmill bicycle exercise with blood pressure monitoring and ECG (Silverthorn, 2009). To be more precise, stress testing is a diagnostic procedure in which the cardiovascular stress that are induced by the pharmacologic agents is usually demonstrated in the patients with some decreased functional capacity. In conducting stress testing, there are two specific types of psychoactive drugs used which may cause tolerance. These drugs are agonists and antagonists.

Antagonists and agonists are the key players in pharmacology and the human body and operate in opposite directions (Silverthorn, 2009). For instance, when agonists produce action, antagonists oppose the same action. Agonist drugs work when muscles relax while antagonist drugs work when the body muscles contract (De Backer et al., 2006). In other words, agonists help in binding and altering function of the activity of the receptors while antagonists assist in binding the receptors but do not alter their activities.

Therefore, agonists' drugs are drugs, which effectively mimic the action of the natural chemical messenger in the human body since it mimic effects of the dopamine in the human brain. They stimulate the dopamine receptors with a lower risk of irreversible and uncontrollable dyskinesia, which is linked to levodopa therapy.

Agonist drugs activate certain opioid receptors in the human brain resulting in full opioid effect while antagonist drugs block opioid receptors by attaching to opioid receptors. To be more specific, agonist drugs are those drugs that bind to receptors and produce biological impact or indirectly produce sale effect of neurotransmitter (Al-Hesayen, Azevedo, Newton & Parker, 2002). These drugs mimic actions of neurotransmitter and their neurophysiological impact and their effect on behavior can be inhibitory or stimulatory, depending on the function of neurotransmitter they mimic. Thus, agonist drugs inhibit neural behaviors and activities in the body.

Antagonist drugs bind to receptors, but they do not produce biological impacts and indirectly inhibits impact of the neurotransmitter and block actions of the neurotransmitter. For instance, the cholinergic antagonist drugs can stimulate or inhibit behaviors.

METHODS:

A sample of 30 male aged between 25 and 45 years who were suffering from the cardiovascular disease were utilized in this study. After the data from the sample had been collected, three different stress tests were conducted. All the participants were treated with both agonists' drugs (Dobutamine, Isoprenaline, and adrenaline) and antagonists' drugs (Metoprolol and prazosin). These tests were; the drug-induced stress test, which included determination of the impact of increasing the three agonists' drugs; that is, Dobutamine, Isoprenaline and adrenaline on the heart rate.The test was also conducted after two antagonists drugs were infused; Metoprolol and prazosin.

RESULTS:

The data analysis of the 30 participants were presented in three distinct graphs.

Figure 1 below displays dose response for three types of the agonists' drugs (Dobutamine, Isoprenaline, and adrenaline). With respect to the figure, it is clearly that a higher dose of the Dobutamine, Isoprenaline and adrenaline drugs results in an increase in the heart rate at a lower dose. Moreover, a significantly high amount of Dobutamine agonist drugs results in an increased heart rate in human being while a considerable large amount of Isoprenaline and Adrenaline lead to a relatively low heart rate.

Figure 1: Dose response for three types of the agonists drugs (Dobutamine, Isoprenaline, and adrenaline).

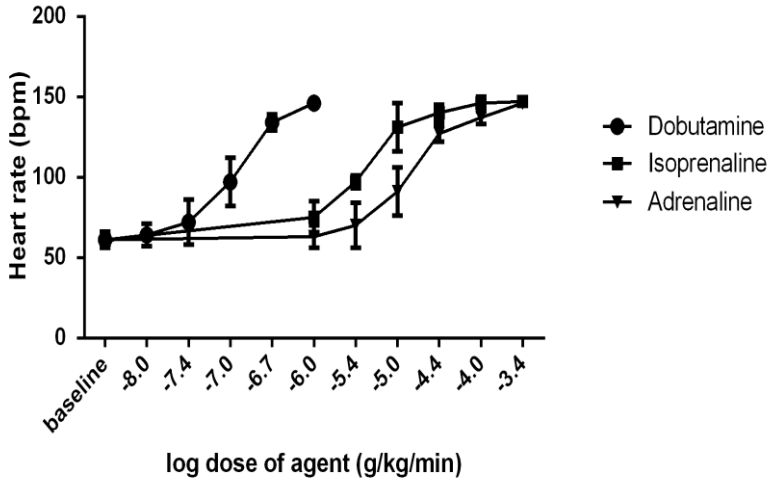


Figure 2 below shows a dose response for Dobutamine alone, Dobutamine in absence and presence of the two antagonists' drugs (Metoprolol and prazosin). Prazosin antagonist drug impact is overrid by the Dobutamine dose when raised from -8 to -7 g/kg/min. With the presence of Metoprolol antagonist drug and participants prescribed with Prazosin antagonist drugs, the heart rate is in similar trend like the controls. On the other hand, the participants prescribed with Metoprolol antagonists drugs show substantial lowering of the heart rate as control exercise intensity increases.

Figure 2: Dose response for Dobutamine alone, Dobutamine in absence and presence of the two antagonists drugs (Metoprolol and prazosin).

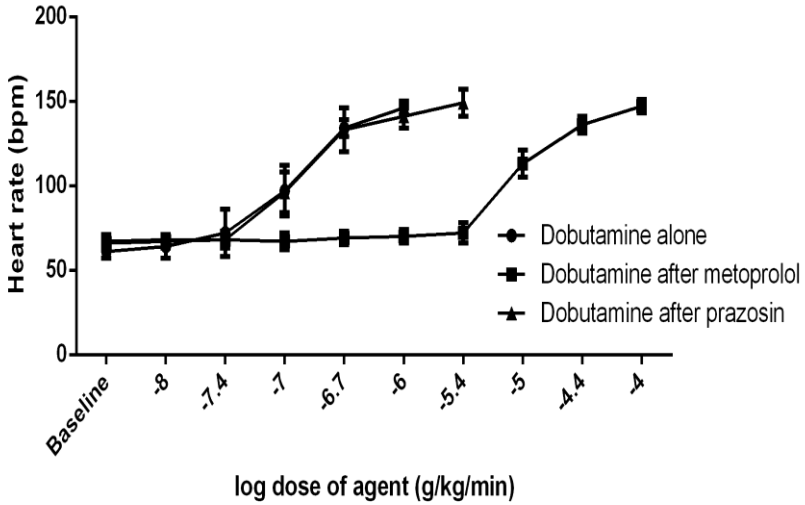
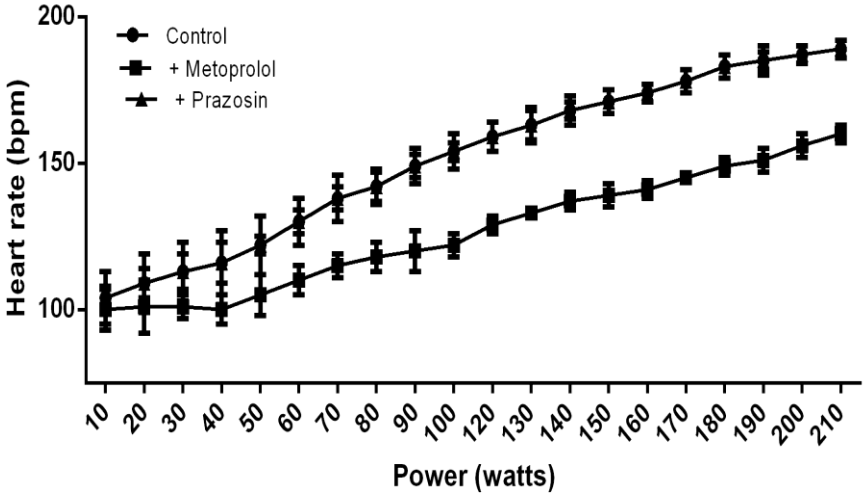


Figure 3 below displays dose response representation of exercise-induced stress test and control with the presence of Metoprolol and prazosin. From the figure, presence and absence of prazosin cause no or minimal change in heart rate as compared to the normal control group. On the other hand, the presence of Metoprolol antagonist drugs lowered patient's heart rate.

Figure 3: dose response representation of exercise-induced stress test and control with the presence of Metoprolol and prazosin.



DISCUSSION:

In this research paper, the impact of Isoprenaline, Dobutamine, and Adrenalinedrugs as agonist drugs and their effectiveness with the presence of the antagonists' drugs is crucial (Leier et al., 2008).

Isoprenaline agonists' drugs are believed to have a higher potency than the Dobutamine agonists' drugs and have substantial impact increasing individuals' heart rate even when prescribed at a lower dosage. Further, Isoprenaline agonist drugs induce a higher level of coronary perfusion. Further, Dobutamine agonist drugs have a lower EC value as compared to both Adrenaline and Isoprenaline.

Besides, Dobutamine agonist drugs are less effective as compared to Adrenaline and Isoprenaline. Nonetheless, when Dobutamine agonist drugs are used together with Metoprolol and Prazosin antagonist drugs, its impact is in a position to overcome the effects of Prazosin antagonist drugs. Remarkably, in the presence of Metoprolol antagonist drugs, Dobutamine agonist drugs decreases its potency.
Further, in controlled exercise heart rate of those individuals who have been prescribed to take Metoprolol antagonist drugs reduces. According to researchers, Metoprolol antagonists is believed to minimize the occurrence of the cardiac muscles, hence reducing heart rate in human beings since it has a cardioprotective impact. This is in consistency with the results of the data analysis on the figures. Prazosin impact as antagonist drug seems a little bit unclear. This is because, when Dobutamine agonist drugs are used with Prazosin antagonist drugs, no antagonist impact can be viewed. The combination shows similar trend like when Dobutamine agonist drug is used alone.

CONCLUSION:

Adrenaline and Isoprenaline are appropriate agonist drugs when prescribed at very low dose. Nonetheless, Dobutamine is a better agonist drug as compared to both Adrenaline and Isoprenaline when prescribed at a higher dose. On the other, hand, Metoprolol is one of the best antagonist drugs, which can block activities of Dobutamine agonist drugs at a low-moderate dose. However, Prazosin antagonist drug impact on heart rate is insignificant.

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