Playing with performance: the use and abuse of beta-blockers in the performing arts

Tim Patston

Geelong Grammar School & Honorary Fellow, Melbourne Graduate School of Education, University of Melbourne

Terence Loughlan

Monash University

Abstract

This article discusses the use of beta-blockers by performing artists, the reasons why they are taken, and the potential associated risks. We argue that there are high levels of usage within sectors of the professional performing arts community and that there may be high levels of risk in using these medications, particularly without medical supervision. Previous studies have mentioned potential risks, but this article will be the first to analyse the potential negative impact of side effects from these medications upon specific aspects of instrumental playing.

Key words: beta-blockers, performing artists, professional performing artists

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Introduction

In the world of sport there has been much discussion since the 1980s about the use of performance-enhancing drugs. From the Olympics to the Tour de France, authorities have endeavoured to reduce the incidence of substances that may give a performance benefit. In the performing arts there is a long history of using substances which may inhibit a real or perceived performance deficit. Some of the most commonly used drugs in music performance are beta-blockers (Brantigan, Brantigan, & Joseph, 1982; Fishbein, Middlestadt, Ottati, Straus, & Ellis, 1988; Kenny, Driscoll, & Ackermann, 2012; Patston, 2010), which are used by musicians to help reduce music performance anxiety (MPA). This article discusses the use of beta-blockers by performing artists, the reasons why they are taken, and the potential associated risks. We argue that there are high levels of usage within sectors of the professional performing arts community and that there may be high levels of risk in using these medications, particularly without medical supervision. Previous papers in this field (Dalrymple, 2005; Kenny, 2011; Nubé, 1991; Packer & Packer, 2005) have mentioned potential risks, but this paper will be the first to analyse the potential negative impact of side effects from these medications upon specific aspects of instrumental playing.

Music Performance Anxiety

Music performance anxiety is a condition that may have a profoundly negative impact upon performing artists (Kenny, 2011; Patston, 2014). The developmental trajectory of MPA is yet to be explored in the literature, but the components of

the condition are now understood. Sufferers of MPA develop a range of cognitive, somatic, and behavioural symptoms which inhibit both their enjoyment of performance and their capacity to perform to the best of their ability (Cox & Kenardy, 1993; Craske & Craig, 1984; Lehrer, 1984; Salmon 1990). In extreme cases musicians may avoid performing, or give up music completely (Fehm & Schmidt, 2006; van Kemenade & van Son, 1995). Beta-blockers are primarily used to ameliorate the somatic symptoms of performance anxiety.

Symptomatology of MPA

The somatic components of MPA are typically those associated with the fight or flight response. Symptoms may include increased heart rate, sweating, tremor, muscle tension, dry mouth, nausea, and frequent urination (see Bartel & Thompson, 1994; Hiner, Brandt, Katz, French, & Beczkiewicz, 1987: Kivimäki & Jokinen, 1994; Roland, 1994). There are reasons that the body reacts with these particular symptoms. Bond Caire (1991) commented that humans are unable to distinguish between physiological and psychological threats and respond to both with equal intensity. This view was shared by Menzies and Moran (1994), who suggested that in anxiety states this reactive response is usually disproportionate to the danger which is faced. Triplett (1983) explained that muscle tension is created in preparation for fast action; the fight or flight response. Blood vessels constrict, which raises blood pressure, causing the body to heat up. Perspiration is then released, but because of the restricted blood supply to the extremities such as hands and feet, this perspiration feels cold. According to Triplett (1983), the muscles of the diaphragm are shortened, which makes breathing shallow. McCallion (1988) concurred with this when he discussed the panic reflex-action of the neck muscles pulling the head down at the back at the same time as raising the shoulders. This also tightens the muscles surrounding the larynx, which may have an impact upon breath-based music activities.

These symptoms are accompanied by increased brainwave activity in the cortex, which changes a person's sense and perspective of time (Menzies & Moran, 1994; Salmon, Schrodt, & Wright, 1989). For the general population these symptoms may be uncomfortable, but this level of physiological arousal does not affect their completion of tasks. There is little data in the literature on the effect of particular symptoms on differing aspects of performance; for example, dry mouth in singers as opposed to muscle tremor in pianists. This is an important area for future research as it would be expected that different symptoms would be more or less troubling depending on the instrument being played.

The issue of symptomatology is particularly relevant when discussing the types of instrument played (Dalrymple, 2005; Kenny, 2011; Nubé, 1991; Packer & Packer, 2005). It is probable that musicians experience MPA in a similar way, but report the symptoms that are most salient to them. For example, a singer may be deeply troubled by dry mouth but a pianist may not notice it. If there is a subsequent perceived or actual level of physical or technical impairment, MPA may be reinforced and escalated. There are no extant studies which have attempted to measure this. It would be expected that if a part of the body is affected by MPA–for example, vasoconstriction causing decreased blood flow in the fingers–, then exponents of an instrument requiring digital dexterity would perceive an impact upon their playing. It is logical to conclude that the reporting of symptoms is influenced by the perceived impact of a symptom upon specific aspects of technique.

The cognitive manifestations, or thoughts, negatively associated with MPA also vary significantly between individuals, although there has been little research attempting to identify specific cognitive mediators which may trigger, maintain, or escalate MPA. Cognitions may be self-oriented, such as those predicting bad performance outcomes, catastrophising, or low self-efficacy (the inability to complete a task) (Steptoe & Fidler,

1987). Thoughts may also be other-oriented, involving, for example, a fear of negative evaluation (van Kemenade & van Son, 1995) or of appearing foolish in public (Ryan, 1998). It has also been suggested that perfectionism may be an important cognitive component of the MPA construct (see Craske & Craig, 1984; Kenny, 2006; Kenny, Davis, & Oates, 2004; Nagel et al., 1981; Patston, 2014; Steptoe & Fidler, 1987). Performers who take beta-blockers believe that an amelioration of the physical symptoms may lead to a calmer mental state, despite beta-blockers not being a specific anxiolytic.

Behavioural manifestations of MPA can be grouped in a number of categories. There are intrinsic behaviours related to the preparation and execution of performance, including avoidance of practice or performance (Salmon, 1990), lacking focus or being easily distracted (Kirchner, 2002), and mood swings or agitation (Roland, 1997). There is also anecdotal evidence of other intrinsic behaviours associated with MPA such as obsessive checking of instruments, or avoidance of instrument maintenance, although these have not been discussed in the literature. Extrinsic behavioural manifestations of MPA may include repeated moistening of the lips, arm and neck stiffness, shoulder lifting, and distressed or deadpan facial expressions (see Brotons, 1994; Craske & Craig, 1984; Kendrick et al., 1982; Sweeney & Horan, 1982).

The combination of physical, mental, and behavioural manifestations of MPA can make it seem an overwhelming condition to a performer. Uncertainty regarding the cause and, indeed, the course of the condition has led performers to explore a range of options to reduce or eliminate MPA. One such option is to take beta-blockers.

Beta-blockers

Beta-blockers were first developed in the early 1970s as a treatment for heart conditions (Warren, Brewer, Orgain, 1976). By the late 1970s performers and researchers had discovered that the physiological symptoms of stress could be alleviated with these drugs. Several early studies studied the impact of beta-blockers, anxiolytics, and antidepressants upon MPA; these studies are, however, unlikely to be repeated due to changed ethical standards in research. A review of these studies may be found in Lehrer (1987), Nubé (1991), and Sataloff, Rosen, and Levy (2000). There is also wide discussion on the Internet through articles and blogs debating the use and efficacy of beta-blockers by musicians (see www.ethanwiner.com/betablox.html, www.bulletproofmusician.com, musiciansway.com/blog/2010/03/musicians-and-beta-blockers/ as examples, accessed February 2013).

There is little empirical data on the prevalence of beta-blocker use among musicians; however, three studies which specifically asked subjects to report beta-blocker use (Fishbein et al., 1988; Kenny, Driscoll, & Ackermann, 2012; Lockwood, 1989) reported figures between 20–30% among professional orchestral musicians. Such figures are disturbing. It is difficult to imagine another profession where up to 30% of workers believe that they require medication to do their job effectively. That musicians may be taking this medication without medical supervision (Fishbein et al., 1988) is of even greater concern, as is the thought that, in cities with professional orchestras, these musicians may also be teachers of instruments with considerable influence on young musicians.

Why do musicians take beta-blockers? The most commonly reported use for beta-blockers is to alleviate physical symptoms, such as hand tremor in pianists (Neftel et al., 1982), bow shake in violinists (Packer & Packer, 2005), or sweaty palms (James & Savage, 1984). Beta-blockers reduce the manifestations of this excessive activity of the sympathetic nervous system. Thus, the sensation of the heart pounding is reduced when the beta-blockers both slow the heart and reduce the force with which it is beating. They also reduce fine tremor by decreasing the heart rate and blood pressure and may also have a role in sedating the person taking the drug. Whilst beta-blockers are not

specifically an anti-anxiety medication, their relief of physical symptoms may be sufficient to reduce anxiety levels in some performers.

The beta-blocker most commonly consumed by Australian musicians appears to be Propranolol (Kenny, Driscoll, & Ackermann, 2012). Propranolol has been used widely and for many years in the treatment of a variety of medical conditions, including high blood pressure (hypertension), rapid heart rates (tachycardias), tremors, and also migraines, especially frequent and predictable attacks. In addition to these three most common indications, Propranolol has been used in other less common situations, and one of these is performance anxiety.

Propranolol's effects on the body revolve around its role in reducing the activity of the sympathetic nervous system or the so-called flight or fight responses. Once stimulated, the sympathetic nervous system causes the release of hormones which activate the nervous system. This results in increased heart rate, increased blood pressure, increased alertness, reduced urine output, as well as the diversion of blood away from the gut and skin, and towards muscle groups. As can be seen, many of these effects are similar to those associated with anxiety. The use of drugs to block the effects of the sympathetic nervous system reverses or reduces the signs of sympathetic nervous system activation. Beta-blockers are a group of drugs that act to interfere with the effects of the sympathetic nervous system on the body. It is this capacity that allows the beta-blockers to be used as medicines.

Propranolol is usually administered by tablet and the drug is absorbed from the intestine. It will take one to three hours for its peak effect to manifest after swallowing and 18 to 24 hours for the drug to be cleared from the body. However, a very large number of side effects have been described for Propranolol over the years. The information about side effects in the following section is taken from the Australian MIMS online resource. This resource is used by medical practitioners when assessing patients' suitability for particular medication. All of the information is mandated by Government authorities and provided by the manufacturer. It is imperative that musicians understand the full implications of taking this medication, and should only do so under medical supervision.

Cardiovascular System

Propranolol usually reduces the heart rate. If the heart rate is reduced to the point where it becomes symptomatic, it can result in light-headedness, fainting, and confusion. A pulse rate of less than 60 beats per minute would usually be indicative of bradycardia; when associated with Propranolol, it would require assessment and reduction of the dose, or cessation of the drug. Cardiac monitoring and treatment may also be necessary until the heart rate returns to an acceptable level. Playing music, whether as a singer or instrumentalist, requires higher than normal levels of physiological arousal. A study by Iñesta, Terrados, Garcia and Perez (2008) measured heart rates for wind, string, and piano players during performance and showed a mean of 139-142 beats per minute. These figures represent a heavy workload, well above the normal resting heart rate, in total contrast to the effects of Propranolol. An effect of Propranolol is to reduce the force with which the heart beats, and if it affects the heart more than expected it can result in congestive heart failure. This is more likely on higher doses of the drug and if there are other associated cardiac problems. Some people have a cardiac illness that results in the abnormal passage of electrical current across the heart, leading to an increased likelihood of abnormal cardiac rhythms. In these patients Propranolol is likely to worsen the electrical activity within the heart. Patients with this type of illness will have a diagnosis of AV block.

Propranolol's main role as a medicine is to lower blood pressure; but if used for other reasons in patients who have already low blood pressure, it will result in hypotension with reduced blood flow to the brain, which may cause fainting. Similarly, if people with a pre-existing illness where

there is insufficient blood flow to the digits take Propranolol, their condition may be exacerbated and they may present with white and tender hands, worsened by trauma or cold. Cold, clammy hands are a frequently reported symptom of music performance anxiety (Hiner et al., 1987: Kivimäki & Jokinen, 1994; Roland, 1994). This could be problematic for musicians who require manual dexterity with their instrument and potentially heighten their levels of anxiety.

Central Nervous System

Propranolol not only works in the blood stream but also crosses the membrane into the brain so that it is possible to experience effects relating to its action on the brain itself. These include light-headedness; mental depression manifested by insomnia, lassitude, weakness, fatigue; catatonia; visual disturbances; hallucinations; vivid dreams; an acute reversible syndrome characterized by disorientation in terms of time and place; short-term memory loss; emotional lability; and mild confusion. Episodes of frank depression have been described that have resolved almost immediately after withdrawal of the drug. Such symptoms are of concern to members of the general population, but are obviously of even greater concern to musicians operating under high levels of concentration in rehearsal and performance.

Gastrointestinal

There are a wide range of conditions that have been reported in people taking Propranolol thought to be associated with the drug; these include nausea, vomiting, epigastric distress, abdominal cramping, diarrhea, and constipation. Given that musicians operate under a rehearsal and performance system with little time flexibility, the possibility of such side effects should be considered before taking this medication. Leaving the stage during a performance due to nausea or diarrhea could possibly trigger feelings of shame or anxiety in a musician.

Respiratory

One of the well-recognised and more common side effects of Propranolol is worsening of bronchospasm or asthma. This is seen in asthmatics, and in general propranolol will not be prescribed to a person who has bronchospastic disease (asthma). The more severe the asthma, the more likely the person is to get worse whilst on Propranolol. This would necessitate immediate cessation of the drug, probably active treatment of the asthma and avoidance of Propranolol thereafter. For those musicians who require an enhanced level of respiratory function compared to the general population, this is a potentially serious issue. Our research revealed only one paper which attempted to analyse the effect of beta-blockers upon respiratory function in musicians (Gates et al., 1985) and one paper (Sataloff, Rosen, & Levy, 2000) which cautions singers and wind-players against beta-blocker use for this reason. It has also been reported (Kreuter, Kreuter, & Herth, 2008) that learning a wind instrument may be beneficial for teenage asthmatics in terms of lung function. Given the potentially serious ramifications of beta-blocker use, particularly in such susceptible individuals, it is clear that research in this area is warranted.

The following side effects are not specifically associated with music performance, but all should be taken into account when considering the use of beta-blockers.

Allergic

As with any drug, it is possible for people to be allergic to Propranolol and the person taking the drug can suffer a potentially severe allergic reaction.

Hematologic

In the medical literature there are a number of blood conditions that have been associated with the use of Propranolol; namely, agranulocytosis, nonthrombocytopenic purpura, and thrombocytopenic purpura. These conditions are all serious and can result in easy bruising or excessive

bleeding and failure to clot. The main thing is to be aware of these risks so that if people notice easy bruising or bleeding, medical assistance can be provided.

Autoimmune

Systemic lupus erythematosus (SLE) is an uncommon autoimmune disorder that can be precipitated or worsened by use of Propranolol. It is associated with a wide variety of symptoms that can include kidney damage and skin disorders, such as rashes.

Skin and Mucous Membranes

Stevens–Johnson Syndrome, toxic epidermal necrolysis, dry eyes, exfoliative dermatitis, erythema multiforme, urticaria, alopecia, SLE-like reactions, and psoriasisiform rashes are all conditions of the skin and mucous membranes that have been associated with the administration of Propranolol.

Genitourinary

Male impotence is common with the administration of Propranolol therapy: specifically, in Peyronie's disease scar tissue forms in the tunica albuginea, which is the thick sheath of tissue surrounding the corpora cavernosa, causing pain, abnormal curvature, erectile dysfunction, indentation, loss of girth, and shortening of the penis. Declining libido and hair loss have also been reported.

Propranolol should not be used in pregnancy because it results in reduced blood, oxygen and nutrient flow to the placenta and baby. Furthermore, it is excreted in breast milk so its administration is not recommended during breastfeeding unless absolutely necessary.

Diabetes and Patients Prone to Hypoglycaemic Episodes

Two important warning signs of impending collapse in such individuals are shaking and increased heart rate. Propranolol could block these physical symptoms which are important early warning signs that would alert the diabetic to ingest calories to avoid collapse.

Conclusion

The high level of use of beta-blockers by professional musicians is of serious concern. This paper has discussed the evidence of use as presented in the literature. Anecdotal evidence suggests rates of beta-blocker use are in fact much higher. Of even more concern is the suggestion, according to a number of professional musicians contacted in confidence by the researchers of this paper, that many musicians seem to self-medicate; purchasing the drugs via the Internet or sharing between colleagues. One professional player interviewed suggested that there is implicit condoning of beta-blocker use by symphony orchestras as "management believe it is a better alternative to alcohol abuse". Such an assertion, if validated, would warrant investigation.

It is clear from the discussion of side effects that beta-blockers, which are taken to alleviate negative symptoms associated with performance, in fact have the potential to reduce performance efficacy, particularly in terms of respiratory and cardiac function. It is also apparent that musicians should be aware of the potential risks associated with these medications.

We recommend that research be undertaken into the true nature of beta-blocker use in the performing arts. Anecdotal evidence indicates that many performers use beta-blockers sporadically, or only for auditions. This is an area of research which needs to be undertaken, as does gaining an understanding of the side effects (if any) associated with infrequent use. We also commend our paper to the employers of orchestral musicians, the symphonies, and ballet and opera companies. Education within the workplace is required to help to address this major issue.

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Dr Tim Patston is Coordinator of Creativity and Innovation at Geelong Grammar School and Honorary Fellow of the Graduate School of Education, University of Melbourne. His areas of research include performance psychology, and applied research in creativity in education and mindfulness in education.

Associate Professor Terence Loughlan MB,BS, FANZCA is Director Anaesthetic Research and Education, Frankston Hospital , Peninsula Health, Gippsland Medical School, Monash University