

## **The Impact of Music on Milk Production and Behaviour of Dairy Cattle**

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### **ABSTRACT**

The influence of music on the milk performance of dairy cattle has been increasingly studied in recent years, although its efficacy is still being debated due to the inconsistent outcomes and a limited number of studies. This study aimed to investigate the impact of music on the milk production and behaviour of 24 lactating Jersey cattle, consisting of 10 primiparous and 14 multiparous cows. The experiment involved milk collection and behavioural observation before and after exposure to music at a dairy farm in Sitiawan, Perak. The results indicate that music and parity significantly affect the milk yield produced by a cow at  $p < 0.05$ . The cows produced significantly less milk after being exposed to music, while multiparous cows recorded significantly higher milk yields than primiparous cows. In terms of the observed behaviour, the cows displayed a significantly higher proportion of feeding and ruminating when no music was played. On the other hand, multiparous cows displayed a significantly lower proportion of feeding and ruminating, and a higher proportion of standing compared to primiparous cows. However, no significant effects of parity and music were observed in walking and lying behaviour. To conclude, music did not improve the milk yield of Jersey dairy cows in this study. Due to the inconsistencies in the outcomes of many studies related to the effect of music on milk yield, more long-term research should be conducted by considering factors that might influence milk yields, such as parity, breed, housing environment, and music selection.

*Keywords:* Behaviour, dairy cattle, milk yield, music, parity

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### **INTRODUCTION**

Malaysia is one of the largest milk-importing countries in the world, after China, Mexico, Algeria, the Russian Federation, Indonesia, Saudi Arabia, and the Philippines (Faghiri

et al., 2019). Malaysia's National Dairy Industry Development Program aims to achieve a 100% self-sufficiency level (SSL) for local fresh milk production by 2025, which is currently at 62% (Aman, 2021). Qatar's major dairy producer has aligned with two of Malaysia's largest dairy farms to enable the country to achieve higher milk SSL so it can be imported to Qatar as the country's demand for milk keeps increasing (Whitehead, 2019). Farmers have explored ways to enhance their cows' milk production in response to government requests. One of the easiest approaches is through music, but the effectiveness of this is still disputed. Music has been known to evoke reactions in humans and a wide range of animals. Music therapy has been proven successful in enhancing body immunity and psychology by reducing stress, anxiety, depression, and pain in humans (Dhungana et al., 2018).

Music is acknowledged as a non-invasive application, and its physical, psychological, and social impacts have been utilised throughout the years (Dağlı & Çelik, 2022). Recent studies have shown that music can increase breast milk production in mothers with premature infants (Dağlı & Çelik, 2022; Jayamala et al., 2015; Varişoğlu & Güngör Satılmış, 2020). Listening to soothing music or sounds has been proven to help people relax, which is especially good for nursing mothers because the inhibition of stress hormones aids breast milk flow (Katili et al., 2021). Music therapy, which has a calming impact, lowers the risk of stress-related physical reactions in mothers of premature newborns who are hospitalised

(Dağlı & Çelik, 2022; Jayamala et al., 2015; Varişoğlu & Güngör Satılmış, 2020). It is accomplished by helping the mothers feel positive and reducing their negative feelings about their babies (Dağlı & Çelik, 2022).

Music has been proposed to improve animal well-being by eliminating unpleasant background noises, reducing anxiety and aggression, and creating auditory enrichment, depending on the animals (Alworth & Buerkle, 2013). Chickens exposed to country music have a significantly lower ratio of heterophilic lymphocytes, lower levels of physiological stress, and displayed grooming behaviours for twice as long (Rickard et al., 2005). Slow music can elicit a response from anxious buffalo cows, making them easier to handle (Dhungana et al., 2018). Reductions in aggressive behaviour and increases in inquisitiveness and sociability have also been observed in chimpanzees exposed to music (Alworth & Buerkle, 2013).

Such an effect can also be seen in dairy cattle, as music can ease them, thus increasing their welfare and milk production (Lemcke et al., 2021). Dairy cattle consider music exciting, which could result in their voluntary movement towards automatic milking systems (AMS) without much coercion (Lemcke et al., 2021). In a recent study, cattle demonstrated most physical signs of relaxation, such as chewing the cud and lowering the eyelids, indicating they were pleased with the slow music (Kemp, 2020). Most cows exhibited fewer stress behaviours, such as sleeping and relaxing, when playing lullaby music (Kemp, 2020).

Dairy cattle responded better to classical, country, and audiobook music, exhibiting fewer aberrant, such as tongue rolling, less vocalisation, and greater movement, which indicated reduced stress and increased welfare (Crouch et al., 2019). In addition, music has also been observed to affect milk production. Studies have shown the positive effects of music on dairy cattle's milk, although these remain sparse.

Dairy farms, particularly those with noisy mechanical milking parlours, can benefit from playing slow music to their cows to alleviate stress and increase milk production by up to 3% (Kochewad, 2022; Lemcke et al., 2021). Listening to classical music for a long time has increased milk production in dairy cattle (Dhungana et al., 2018; Ganesh, 2020; Liu et al., 2017; Ma & Wang, 2020). While some music genres have a soothing effect, which can reduce stress in dairy cattle and increase their milk supply, others have a numbing effect that could increase the cows' tension and reduce the milk supply (Donghai et al., 2018; Ganesh, 2020). Some studies found that music had no effect on milk production, although the cows demonstrated relaxed behaviours when some form of music was played (Kemp, 2020; Lemcke et al., 2021).

Due to the mixed results concerning the role of music on dairy cattle's milk production, more studies need to be conducted to investigate other factors that may have contributed to these inconsistent findings, such as breed, parity, nutrition, environment, stress, and song selection. In Malaysia, providing music therapy to dairy

cattle is not common. Although Malaysia's milk production constantly increased between 2011 and 2017, this was still not enough to sustain milk consumption, which nearly quadrupled between those years (Suntharalingam, 2019). If music therapy can consistently increase milk production in dairy cattle, it would be highly beneficial to farmers as they could use this relatively cheap method of enhancing milk production on their farms.

Therefore, this study was conducted to investigate the effect of music on the milk performance and behaviour of primiparous and multiparous Jersey dairy cattle on a dairy farm in Perak, Malaysia.

## METHODS

### Sampling Site

This study was conducted at Cherry Alpha Sdn. Bhd. in Sitiawan, Perak, located at 4°14'58"N and 100°44'12"E. Cherry Alpha Dairy Sdn. Bhd. has been providing high-quality Jersey milk since its establishment in 2014 on a local family farm. The farm has 200 purebred Jersey cows: heifers, pregnant cows, and lactating cows.

### Animals, Facilities, and Management

The farm's approximately 100 lactating Jersey cows were kept together in a 59 m × 40 m pen. Of these, 24 individuals which were healthy and not in heat were selected to undergo this study. The sample consisted of 10 primiparous and 14 multiparous individuals, with an average of 206 days after giving birth to calves. The dairy cattle

were milked twice daily at 7.30 a.m. and 4.00 p.m. using an automatic milking system (AMS). Using the AMS, a total of 48 Jersey dairy cattle could be milked at one time, and they would then be returned to their pen after the milking sessions. All the cattle on the farm were fed fresh straw *ad libitum*, with the addition of vitamin supplements and dairy cattle pellets in the morning. Drinking water with added minerals was also provided throughout the day. The cattle were also sanitised and cleaned before each milking session.

### Data Collection

This study was conducted in March 2022 for a total of 13 days, and it involved milk collection and behavioural observation before and after exposure to music. The experiment started with data collection for five days without music, followed by a one-day habituation period when the cows were exposed to music without any milk collection and behavioural observation and continued with data collection for seven days with music (Figure 1).

During the final seven days, music was played during milking in the area (7.30 a.m. until 8.30 a.m.) and in the shed for three hours after milking (9 a.m. to 12 p.m.). Two wireless Bluetooth speakers (SonicGear Super P8000, China and Armaggeddon Puma III, Singapore) were used throughout the experiment. One Bluetooth speaker was set up in the milking area, approximately 0.96 m above the dairy cattle’s heads. The sound pressure levels were kept below 85 dB, and frequencies were kept between 23 and 35 kHz; these were checked using Arduino Science Journal apps to ensure that the music reached the cattle’s ears and did not disturb them (Alworth & Buerkle, 2013; Lemcke et al., 2021). A total of 23 songs were chosen and combined into one playlist, which consisted of French classical piano, flute music, Richard Clayderman’s classical piano music, and Mozart’s classical music since these types of music have been shown to increase milk production in the previous studies (Ganesh, 2020; Liu et al., 2017; Ma & Wang, 2020).

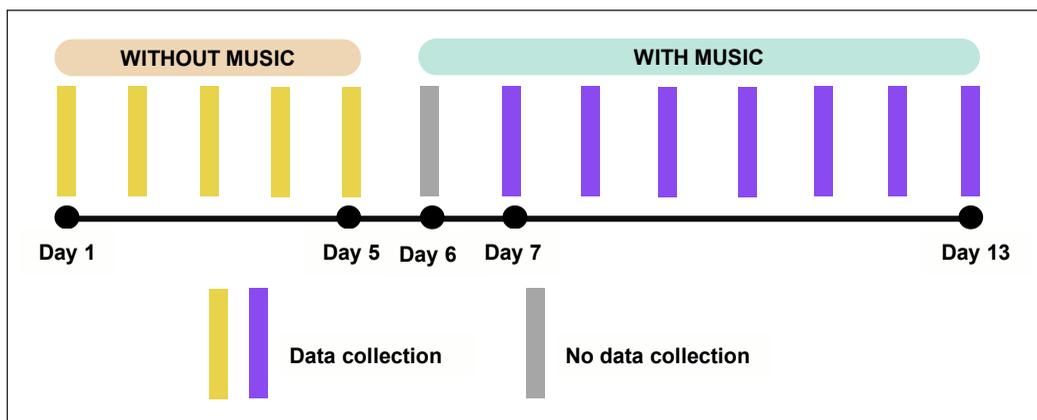


Figure 1. Experimental period with and without music

**Milk Collection**

The cows in this study were milked together based on their parity, and the starting order was alternated each day. The keeper took the cows to the milking parlour, and their teats were attached to the cups. The suckling process took around five minutes on average, depending on the cows (Figure 2). The milk was then drawn into the pipeline and the Mueller milk cooling tank (Mueller Model U Open Tank, U-2000, USA), as shown in Figure 3. The milk was then measured using a measuring dipstick. The volume of milk

collected was recorded approximately two minutes after the suckling machine stopped.

**Behaviour Observation**

The cows' behaviour was recorded using instantaneous scan sampling 30 min after the morning milking session; three scans were performed, with a 10-min interval between each scan. One observer recorded all the cattle's behaviours to eliminate the effects of various interpretations. The observed behaviours are described in Table 1; some are shown in Figures 4, 5, 6, 7, and 8.



Figure 2. Suckling process



Figure 3. Mueller Model U Open Tank

Table 1  
Description of dairy cattle behaviour

Behaviour	Description
Feeding	The cow lowers its head towards the feeding trough, puts the food (either maize, straw, or pellets) into its mouth, and chews before swallowing it
Rumination	The cow re-chews the cud completely before swallowing it with its head down, and its eyelids lowered while standing or lying
Drinking	The cow places its muzzle in the drinking trough and consumes water

Table 1 (continue)

Behaviour	Description
Standing	The cow stands with all four legs on the ground for at least five seconds
Walking	The cow moves forward more than three steps
Lying	The cow lowers its body, folds all its legs to the ground, and dozes off with its eyes open or closed and with its head down or up
Vocalisation	The cow makes different types of sounds, such as mooing, bellowing, snorting, and grunting
Aggression	The cow pushes or strikes another cow on the other side using its head or body
Tongue rolling	The cow flicks its tongue outside its mouth and then rolls it back inside
Grooming	The cow licks its own body or licks other cows on the head or neck
Licking minerals	The cow licks the mineral block to supply its body with minerals
Scratching	The cow rubs its body by moving back and forth against any object, such as a pole and fence



Figure 4. Feeding behaviours. The cows were eating pellets (A), fresh maize (B), and straw (C)

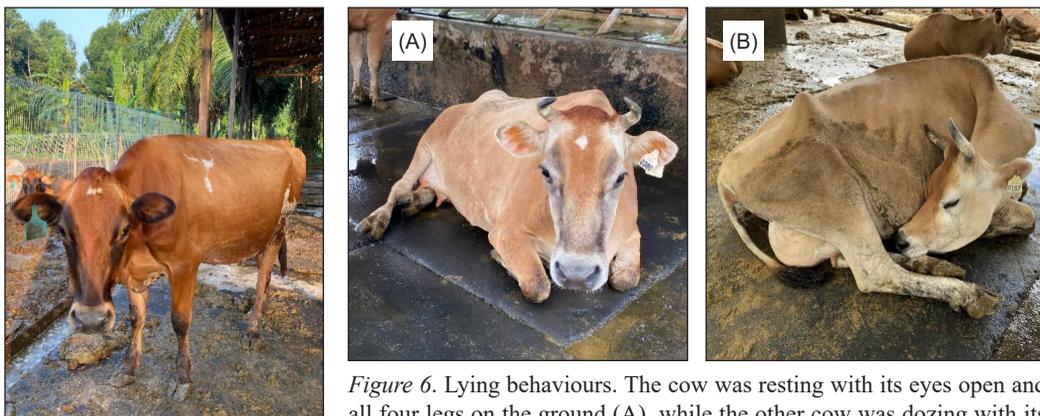


Figure 5. Standing behaviour

Figure 6. Lying behaviours. The cow was resting with its eyes open and all four legs on the ground (A), while the other cow was dozing with its head down (B)



Figure 7. Tongue rolling behaviour



Figure 8. Licking behaviour

### Statistical Analysis

The average milk yields were calculated by dividing the milk yield by the number of individuals, as the assessment referred to the milk collected from the whole group, not individuals. It was then analysed using the general linear model (GLM) univariate procedure, with music, parity, and their interaction fitted as fixed factors. For the general pen behaviours observed using instantaneous scan sampling, only feeding, rumination, standing, licking mineral, walking, and lying behaviours were analysed due to the infrequent display of the other behaviours. The behaviours were expressed as a proportion of the overall scan for each individual per day and analysed using Wald test in a generalised linear model (GsLM), which fitted a binomial distribution with a logit function. For all analyses, any significant difference was considered at  $p < 0.05$ . IBM® SPSS® Statistics (version 26) was used to analyse all the data.

## RESULTS

### The Average Milk Yield Before and After Music

The cows' milk production was found to be affected by music and parity (Table 2).

However, the interaction between the two factors had no impact on the milk yield ( $F = 0.008$ ,  $df = 1$ ,  $p = 0.928$ ).

Table 2

Average milk yield with Standard Error of Mean by female Jersey cattle based on music availability and parity

	Average milk yield (L)	F-test
<i>Music availability</i>		
No	3.454 (0.261)	$F_1 = 4.771$ ,
Yes	2.708 (0.220)	$p = 0.041$
<i>Parity</i>		
Primiparous	2.543 (0.241)	$F_1 = 9.943$ ,
Multiparous	3.619 (0.241)	$p < 0.05$

### Behaviours Observation

Among the six behaviours analysed, feeding and rumination were found to be significantly affected by both music and parity (Table 3). When there was no music, the cows performed significantly higher proportions of feeding and rumination than when music was played (Table 3). Higher proportions of rumination and feeding were also observed in primiparous cows compared to multiparous cows. It contrasted with standing behaviour, whereby multiparous cows displayed a significantly higher proportion of standing than primiparous cows. However, no significant effect of music was found on the proportion of standing in the dairy cattle. There was a tendency for music and parity to affect licking mineral behaviour (Table 3). On the other hand, both music and parity did not significantly affect the proportion of walking or lying behaviour observed in the cows (Table 3).

Table 3

Mean proportion of observation with Standard Error of Mean, where specific behaviours were displayed by female Jersey cattle observed during scan sampling (feeding, rumination, standing, licking mineral, walking, and lying), based on music and parity

Behaviour	Music availability		Parity	
	No	Yes	Primiparous	Multiparous
Feeding	0.38 (0.029)	0.30 (0.020)	0.39 (0.027)	0.29 (0.022)
	Wald = 5.508, $df = 1$ , $p = 0.019^{\#}$		Wald = 8.652, $df = 1$ , $p < 0.05^*$	
Rumination	0.38 (0.029)	0.31 (0.020)	0.40 (0.027)	0.29 (0.022)
	Wald = 4.788, $df = 1$ , $p = 0.029^{\#}$		Wald = 9.219, $df = 1$ , $p < 0.05^*$	
Standing	0.15 (0.021)	0.16 (0.017)	0.09 (0.015)	0.26 (0.021)
	Wald = 0.169, $df = 1$ , $p = 0.681$		Wald = 35.506, $df = 1$ , $p < 0.05^*$	
Licking mineral	0.02 (0.009)	0.04 (0.008)	0.02 (0.007)	0.04 (0.011)
	Wald = 1.959, $df = 1$ , $p = 0.162$		Wald = 3.420, $df = 1$ , $p = 0.064$	
Walking	0.04 (0.012)	0.02 (0.006)	0.03 (0.009)	0.04 (0.009)
	Wald = 2.100, $df = 1$ , $p = 0.147$		Wald = 0.505, $df = 1$ , $p = 0.477$	
Lying	0.20 (0.024)	0.22 (0.018)	0.22 (0.023)	0.20 (0.019)
	Wald = 0.302, $df = 1$ , $p = 0.583$		Wald = 0.727, $df = 1$ , $p = 0.394$	

Note. # = Significant differences in behaviours displayed between periods with and without music ( $p < 0.05$ ); \* = Significant differences in behaviours displayed between parity ( $p < 0.05$ )

## DISCUSSION

In this study, the cows produced significantly less milk when exposed to music than when there was no music. It was similar to the findings obtained by Donghai et al. (2018) and Ganesh (2020), which showed a decrease in the milk yield produced by Holstein dairy cattle after being exposed to ragas, African percussion, and rock music (Donghai et al., 2018; Ganesh, 2020). However, the types of music used in this study were French classical piano, Richard Clayderman's classical piano, flute, and Mozart's classical music, which were similar to the genres used in previous studies that were found to generate a positive effect on milk production (Ganesh, 2020; Liu et al., 2017; Ma & Wang, 2020). One of the reasons for these contradictory results may

be the ambient temperature in the cowshed. In the study conducted by Ganesh (2020), the cows recorded significantly lower milk yields when exposed to flute music in the summer compared to during the winter, which demonstrated the significant role of the interaction between music and ambient temperature in milk production. It reflects the finding in the current study as the weather during the experiment was constantly warm and sunny, which may have affected the cows' milk production to some extent, even though all the music played, including flute music, has been shown to have a positive impact on milk yields in previous studies. In addition, it was also possible that the selection of music used in this study may not have been adequate for calming the cows during milking, especially

when combined with the loud noise of the AMS engine, which may have stressed the cows. Uncomfortable environmental conditions can affect the secretion of adrenaline and pituitary gland hormones. Adrenaline hormones diffuse into the bloodstream, particularly into the umbilical cord, causing the udder muscles to tighten and resulting in decreased milk production (Mutiasari et al., 2018).

The decrease in milk yield after being exposed to music may be due to the cows' handling before the milking procedure, which might have distressed them. Man-animal interaction is one of the most common factors that may cause stress to livestock (Ciborowska et al., 2021). In this study, the selected cows had to be fetched, handled, and steered in the right direction for their milking sessions using the AMS, which was different from their normal days before the experiment was conducted. During the five days of the experiment, before the music was played, the cows were also fetched and steered, but the effects of the cows' stress perhaps began to show a few days later when the music started to be played. Further investigation may be needed to clarify this. However, some studies have identified a positive effect on milk production after cows were exposed to music (Ganesh, 2020; Liu et al., 2017; Ma & Wang, 2020).

Dairy cattle produce more milk when they hear music that mimics their normal pulse, which explains why light music increases lactation (Liu et al., 2017). An increase in the gamma-aminobutyric acid (GABA) content in the blood of cattle,

thus promoting the secretion of growth hormones, could also be seen when light music was played (Ma & Wang, 2020). Other studies also found no association between milk yield and music (Kochewad et al., 2022; Lemcke et al., 2021). Even though the highest milk output occurred when no music was played, the cows demonstrated relaxed behaviours such as sleeping and relaxing when some music was played, indicating reduced stress and increased welfare (Kemp, 2020).

The milk yield for multiparous cows was significantly higher than that of primiparous cows. This result was supported by previous studies, which stated that multiparous Holstein cows produced more milk than primiparous cows (Meikle et al., 2004; Morales-Piñeyrúa et al., 2022; Pahl et al., 2015; Wathes et al., 2007). It was a biologically normal lactation curve for primiparous cows, which usually peak later, produce less milk, and are more persistent than multiparous cows (Siewert et al., 2019). Cows milked more frequently generate more milk, which is why multiparous cows produce a higher milk yield (Siewert et al., 2019).

Feeding is one of the major behaviours in ruminants, and they spend much time on it (Llonch et al., 2018). It was interesting to find that music impacted the feeding behaviour of the Jersey dairy cattle. In this study, the cows fed more without music than when music was played. There were mixed results regarding feeding behaviour and music availability. A study on other animals found that quails subjected to

random, metallic, reggae, or classical music consumed significantly less food than quails not exposed to any form of music (Cabara et al., 2017). Some other studies have shown results that contradict this study, whereby music was found not to influence the feeding behaviour of piglets, while classical music was observed to enhance broilers' feed intake and time spent eating (Li et al., 2019; Zhao et al., 2020). According to Llonch et al. (2018), animal well-being is linked to feeding behaviour, while Kriengwatana et al. (2022) stated that music has been suggested to improve welfare in animals by increasing the complexity of the surroundings that animals might sense, perceive, and respond to, which triggers brain development and the expression of a wide range of behaviours.

Animals may respond differently to different sounds, frequencies, and intensities (Li et al., 2019). Dairy cattle can pick up frequencies that range from 23 to 35 kHz, which includes some of the ultrasonic range from 16–35 kHz and noises lower than 85 dB (Alworth & Buerkle, 2013; Lemcke et al., 2021). However, it has been reported that cattle exposed to sounds of 80 dB consumed less food, became agitated, and had faster heart rates (Ciborowska et al., 2021; Solan & Józwik, 2009). It could explain why the cows in this study fed less in periods with music, even though the maximum noise audible to cows was 85 dB, as other studies recommended, which was the level applied in this study (Arnold et al., 2007; Lemcke et al., 2021; Weeks et al., 2009). The music played in this study could have been misinterpreted by the cows as noise, causing them to eat less.

Parity also affected feeding behaviour, as primiparous cows were observed to feed significantly more than multiparous cows. Some studies have shown contradictory results, whereby multiparous cows consumed more food than primiparous cows due to their higher social dominance, which typically produces a greater quantity of milk (Bach et al., 2006; Maekawa et al., 2002). Primiparous cows ate significantly more during the 10-min scan sampling period than multiparous cows, which might be explained by the fact that they required more time to eat and had less competition at the manger to acquire their maximum feed intake (Maekawa et al., 2002). Furthermore, younger cows consume food more slowly and spend more time feeding than older cows (Beauchemin, 2018; Neave et al., 2017). The lower proportion of feeding by multiparous cows might also have been due to the longer time spent milking (Hart et al., 2013), although this parameter was not specifically recorded in this study.

Rumination was discovered to be voluntarily regulated by the animals, and if they were distracted in any way, such as when they were being milked or fed, they would discontinue ruminating (Beauchemin, 2018; Paudyal, 2021). The Jersey dairy cattle in this study ruminated more without music than when music was played. These results contrast with other findings that music can improve animal welfare for some animals like rats, chimpanzees, dogs, and even dairy cattle (Alworth & Buerkle, 2013; Dhungana et al., 2018; Kemp, 2020). However, as mentioned above, the cows in this study might have been disturbed by the

music played and perceived as noise due to its intensity (Dhungana et al., 2018). Some studies have stated that noises above 85 dB may potentially increase stress or anxiety (Alworth & Buerkle, 2013; Dhungana et al., 2018). The cows might still not have become used to having music because the data was collected only one day after they were habituated to the presence of music.

In this study, primiparous cows ruminated more than multiparous cows, which other studies have also found (Pollock et al., 2022; Stauder et al., 2020). These results could also be observed in other animals, such as early weaned primiparous beef cows, which ruminate more frequently than multiparous beef cows, and primiparous ewes, which ruminate significantly more frequently than multiparous ewes (Ungerfeld et al., 2011; Yusof, 2019). Cows with lower feeding rates due to feeding restrictions or diet composition tend to display higher rumination times to compensate for the longer particle sizes of the ingested feed (Beauchemin, 2018; Mikuła et al., 2022). It has also been observed that rumination peaks four hours after feeding (Beauchemin, 2018). It is consistent with the outcomes of this study, as the primiparous cows, which were lower on the social hierarchy than multiparous cows, ate later due to the presence of multiparous cows (Bach et al., 2006). Multiparous cows may be hungry and bothered by the cowherd's pellet barrels, thus reducing their rumination time (Paudyal, 2021; Schirmann et al., 2012).

It was not fully clear why multiparous cows stood more than primiparous cows in

this study. Many multiparous cows might have been in the shed, which increased their competitiveness at the feed bunk (Proudfoot et al., 2009). Since multiparous cows almost always feed first during the provision of concentrate feed, this might have contributed to the greater competition between them. Additionally, it was observed that the cows started to stand approximately 15 min before their pellet feeding time or when they heard the pellet barrels, so that they may have been anticipating the provision of concentrate feed by the cowherd.

In this study, the cows tended to lick minerals in periods with music compared to when no music was played. Ruminants, particularly cows, would lick mineral blocks, which provide various minerals vital to their well-being; this may increase milk production with a high-fat content (Kikelomo, 2016). As this was the first study to investigate the relationship between the mineral-licking behaviour of cows with music available, the results cannot be explained in detail. Ruminants need to supplement their diet with mineral (salt) licking when forage or feed sources are mineral-deficient, which might also prevent other behaviours like licking each other, licking wood, and fence chewing (Kikelomo, 2016). It could be seen as a good sign, implying that the cows tended to add minerals into their body while the music was played because music has been suggested to improve their welfare. Multiparous cows tended to lick the mineral more than primiparous cows. Increased mineral intake improves milk production and growth rates,

according to McDowell (2002), which could be associated with higher milk production in multiparous compared to primiparous cows (Meikle et al., 2004; Morales-Piñeyrúa et al., 2022; Pahl et al., 2015; Wathes et al., 2007). Most of the studies on the use of music to milk production and behaviour have been conducted on Holstein dairy cows, which opens the possibility that breed is one of the factors that may have influenced the outcomes of this study.

In this study, no differences between parity and music could be observed in terms of walking and lying behaviours. Unfortunately, no study has yet been conducted to investigate the relationship between music and walking. However, previous findings in dogs showed a significant increase in lying behaviour when classical music was played (Bowman et al., 2017). The amount of time cows spent lying down might provide insights into their welfare and health (Lovarelli et al., 2020; Temple et al., 2016; Tucker et al., 2021). Therefore, the results suggest that the cows may already have been in good condition, or they were not bothered by the presence of music because they would still lie down or walk whether music was played or not.

## CONCLUSION

Overall, the results showed that music negatively impacts milk production in primiparous and multiparous Jersey dairy cattle. It could be because the cows perceived the music as a cause of stress and disturbance. Interestingly, the music

played during this study had an impact on the behaviour of the cows, whereby they were observed to display lower proportions of feeding and rumination when the music was played compared to when no music was played, possibly due to discomfort or anxiety. Despite the negative effect of music on milk production, this study may still provide useful information for dairy farmers pursuing music therapy for their dairy cows. As suggested by other researchers, music may have a long-term influence on milk production. Therefore, to better understand the effects of music on the milk yield and behaviour of dairy cattle, it may be beneficial to collect the data over a longer period and consider other factors such as parity, breed, housing environment, and music selection.

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